HEATING AND VENTILATING

30TH

1904 - 1934

How to Figure the cost of STEAM TRAPS

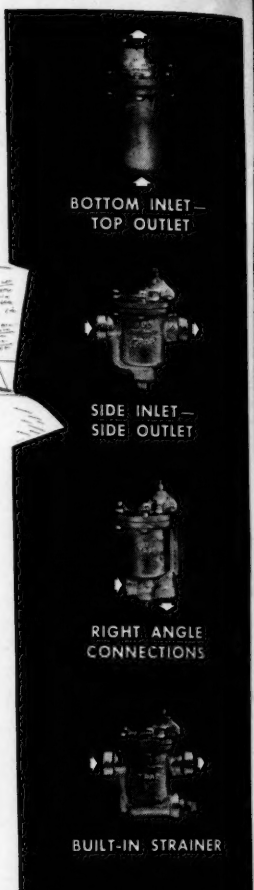
1. PRICE—you get a lot of trap for your money when you buy an Armstrong: big capacity in small size; the long-lasting mechanism in traps for low and medium pressures is identical in design, workmanship and materials, to that in traps for 900 degrees, 950 lbs. pressure!

2. INSTALLATION—Armstrong gives you a choice of body styles to save installation labor and pipe fittings.

3. MAINTENANCE—Armstrong traps last longer! You save labor, parts cost and downtime. Freedom from leakage saves fuel.

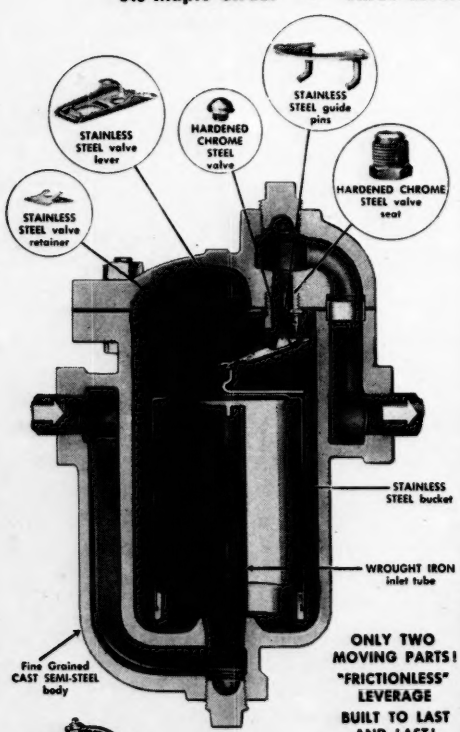
Divide total trap cost by the life of the trap to get *costs per year*—this is where Armstrong traps really shine. Call your Armstrong Representative for the traps you need now, or write:

ARMSTRONG MACHINE WORKS
846 Maple Street • Three Rivers, Michigan



Full Facts In
FREE Catalog J

Catalog J, also an educational handbook on condensate drainage, gives sizes, prices and capacities of Armstrong traps. It tells how to select traps; how to make hook-ups; how to trouble-shoot. Send for a copy today.


STAINLESS STEEL valve lever
HARDENED CHROME STEEL valve
STAINLESS STEEL guide pins
HARDENED CHROME STEEL valve seat
STAINLESS STEEL valve retainer
STAINLESS STEEL bucket
WROUGHT IRON inlet tube
Fine Grained CAST SEMI-STEEL body
ONLY TWO MOVING PARTS!
"FRICTIONLESS" LEVERAGE
BUILT TO LAST AND LAST!

STEAM TRAP CHECK LIST	ARMSTRONG TRAPS
Hardened chrome steel valve and seat?	Yes
All other parts stainless steel?	Yes
Long-lasting "frictionless" leverage?	Yes
Self-cleaning, non-clogging operation?	Yes
Choice of body styles?	Yes
Available with built-in strainers?	Yes
Available with internal check valves?	Yes
40 years inverted bucket trap experience?	Yes
Guaranteed *unconditionally* to satisfy?	Yes

ARMSTRONG STEAM TRAPS COST LESS!

SHOOT COOLING AIR 60 FEET ...WITHOUT DUCTS!

"HY-V" AIR JETS project a stream of cooling air to plant hot spots at velocities up to 5780 FPM. The "Hy-V" is a 14-blade axial flow pressure fan built into a nozzle-shaped housing. This fan eliminates expensive ductwork and it's flexible too — it can be aimed up, down or from side to side. And since "Hy-V" hurls the air stream as far as 60 feet, it can be mounted in an out-of-the-way location.

COOLS WORKERS The "Hy-V" Air Jet spot-cools men exposed to heat from ovens, furnaces, forges or molten metal. Workmen become less fatigued and require less time out.

COOLS EQUIPMENT "Hy-V" Air Jet directs a concentrated stream of air onto machinery and equipment that must be cooled in a hurry. Quick cooling with "Hy-V" can often speed up production and cut manufacturing costs.

COOLS PRODUCT A high-velocity stream of air can be pin-pointed on a product in process for faster cooling or drying.

These fan units are furnished with wall-mounting brackets or on wheeled stands. Fan wheel diameters range from 18" to 30". Further details are covered in Bulletin DH-8-54. Send for your free copy today.

MAIL COUPON TODAY

DeBothezat Fans
Division of
American Machine and Metals, Inc.
EAST MOLINE, ILLINOIS

DeBOTHEZAT FANS DIVISION
American Machine and Metals, Inc.
Dept. HV-654, East Moline, Illinois

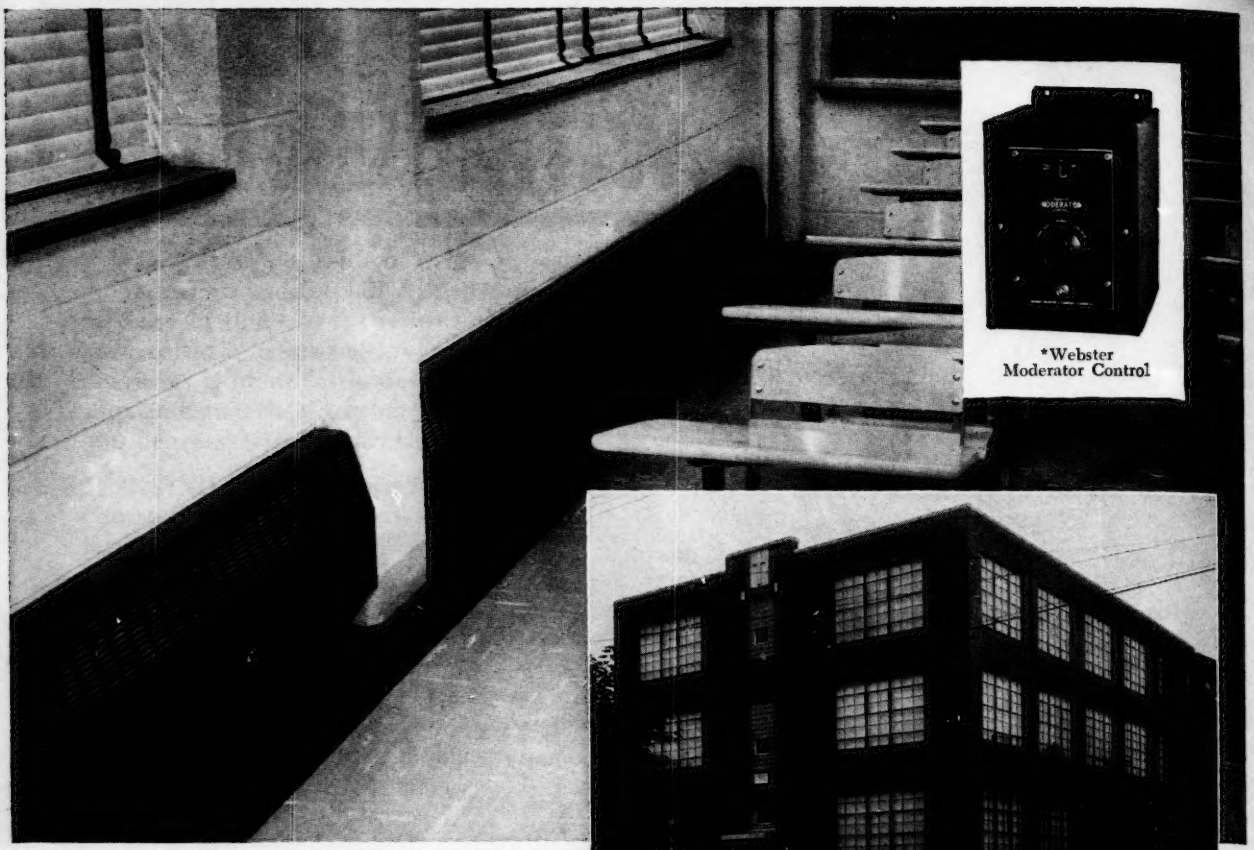
Send free Bulletin DH-8-54 containing complete data on "Hy-V" Air Jets.

FIRM NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

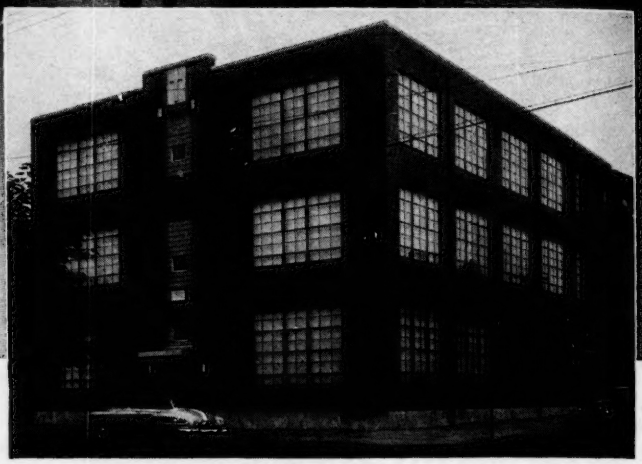
NAME AND TITLE _____



*Webster Moderator Control

Classroom view, Our Lady of Mt. Carmel School. Tru-Perimeter Heating with Webster Walvector. Sleeves in columns between windows simplify piping without loss of structural strength.

*Webster EH-10 Moderator Control unit. One of three compact, rugged units which comprise the entire steam heating control installation for this school. Other units not shown are a compact Outdoor Thermostat and a motor-operated Steam Control Valve.



Our Lady of Mt. Carmel School, Camden, N. J. Floor space, 15,311 sq. ft. Construction cost (not including land, financial and legal expenses) $200,000. Heating cost, $14,580. Architects: Gleeson & Mulrooney, Philadelphia. Consulting Engineer: William G. Flurer, Upper Darby, Pa. Heating Contractor: Fred W. Schorpp, Inc., Camden.

11-Room School — $200,000

Gleeson & Mulrooney, Philadelphia school architects, designed this three-story school building, completed in 1953 at a cost of $13.10 per square foot. The bright, appealing classrooms accommodate 650 pupils. High windows assure ample light and air.

Economy in first cost was aided by the simplified exterior and absence of unnecessary frills. Nevertheless, the building has such features as slate sills, vermin-proof walls, ventilated clothes closets and well lighted corridors. *And the complete Webster Tru-Perimeter Heating System with Webster Moderator Control required less than 7½ per cent of the construction cost.*

Webster Walvector spreads the heat evenly along the perimeter of the building, blankets the large window areas, takes no usable floor space. Low pressure steam is under Webster EH-10 Moderator Control, which varies heating automatically with changes in outdoor temperature . . . provides manually for quick heating of rooms when classes arrive, reduction of heat when they leave. Steam circulation is facilitated with Webster Traps, Valves and Webster Double Service Valves. The rugged, single-unit Webster Moderator Control involves minimum maintenance cost – no blowers or fans, no buried or inaccessible piping.

Is there a project on which *you* can use Webster Walvector and EH-10 Moderator Control to save money for a local school board? Call your Webster Representative.

Address Dept. HV-6

WARREN WEBSTER & COMPANY

Camden 5, N. J., Representatives in Principal U. S. Cities

In Canada, Darling Brothers, Limited, Montreal

WEBSTER

MODERATOR

SYSTEM

OF STEAM HEATING

"Controlled by the weather"

HEATING AND VENTILATING

A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, PLUMBING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

JUNE, 1954

VOLUME 51—NO. 6

CONTENTS

Centrifugal Pump Types and Trends—I. J. Karassik, R. Carter 73
Fluid Flow Studies in Clear Plastic Models 76
Air Conditioning a Glass Enclosed Bank Building—V. A. Bianculli 77
Large Volume Fluid Metering Test Program 79
Design Criteria for Industrial Heating and Ventilating—M. A. O'Neill . . 80
Heating and Ventilating's 50th Anniversary Section 83
Flooded Coils in Closed Heating Systems—T. W. Reynolds 103
Cleveland Auditorium to be Air Conditioned 130

REFERENCE MATERIAL

Section—Year-Round Air Conditioning—W. R. Yeary 87
Detail Sheet—Piping for Fuel Oil Burners 119
Data Sheet—Weights of Galvanized Steel Ducts . . . . . Opposite 168

DEPARTMENTS

Washington News—L. J. Overman 4
Briefly Stated 8
Piping and Plumbing—L. Blendermann 106
London Letter 108
News of Equipment and Materials 110
Experience is my Classroom—T. W. Reynolds 125
Would Would You Do? 128
Product Applications 132
New Catalogs . . . . . Opposite 136
News of the Month 138
Abstracts and Reviews 152
Ad-Digest . . . . . Opposite 152
Canadian Degree-Days for April, 1954 154
Coming Events 154
Degree-Days for April, 1954 158
Index to Advertisers 167

Editorial Staff

Editor
CLIFFORD STROCK

Associate Editors
NATHAN N. WOLPERT
WILLIAM B. FOXHALL

The contents of Heating and Ventilating are indexed monthly by Industrial Arts Index and by Engineering Index, and are microfilmed by University Microfilms, Ann Arbor, Michigan.

Publisher

THE INDUSTRIAL PRESS
Editorial and Circulation offices at
148 Lafayette St.,
New York 13, N. Y.

President
ROBERT B. LUCHARS

Vice-President and Treasurer
EDGAR A. BECKER

Secretary and Publishing Manager
HAROLD L. GRAY

Subscription Rates

HEATING AND VENTILATING, published monthly by The Industrial Press, 116 Main St., Norwalk, Conn. Executive offices 148 Lafayette St., New York 13, N. Y. Entered as second-class matter, February 16, 1954, at the Post Office, Norwalk, Conn., under act of March 3, 1879.

Subscription rates in the United States and Canada, one year, $3; two years, $5; three years, $6; in all other countries, one year, $7; two years, $11. Single copies 30 cents.

Copyright, 1954, by The Industrial Press, New York, N. Y. Permission required to reproduce articles in whole or in part.

Representatives

CHICAGO 1
George G. Turner
228 North La Salle Street.

NEW YORK 13
Harry J. Twine, Thomas A. Earing
148 Lafayette Street.

CLEVELAND 12
Edward B. McEntee
17115 Hillsboro Road.

LOS ANGELES 5
Robert H. Deibler
2506 W. 8th Street.

MEMBER: Audit Bureau of Circulations—National Business Publications—Society of Business Magazine Editors

Washington News

LORING F. OVERMAN

IN Washington, some are beginning to talk again as though world peace were something for optimists to dream about, but not for practical people to really expect or hope for.

They're saying that we suffered a diplomatic defeat at Geneva. That the fall of the French outpost in Indo-China may require us to change our course. Senator Knowland, Republican leader has sent up a trial balloon to see what the public—the fathers and the mothers of those of military age—think about this S.E. Asia business. Washington observers say we could be "in it" by mid June.

So Washington is again wondering whether it should provide the President with stand-by controls—just in case. Some Senators are hinting that it may be necessary to increase the defense budget above the $29 billion planned for 1955. Others are saying that no such thing is contemplated. These many charges and counter-charges, it seems safe to conclude, are trial balloons to test public reactions, as well as warnings which should not be taken too lightly.

Another Balloon

This column—written for those whose business it is to thaw the frigid and cool the hot-heads—thinks it high time to release another trial balloon. "Wouldn't it be wonderful," this balloon suggests, "if all peoples of the world could demand that the Atom-Hydrogen bomb be outlawed. And wouldn't it follow that the $100 billion or so set aside each year for defense by the world's nations, could be used for food, clothing, housing and things constructive!"

Is such an idea hopeless? Useless? Senseless? Perhaps so, but this writer finds considerable solace in the fact that poison gas—outlawed at the close of World War I—has remained taboo for 35 years. True, gas shells and masks have been standard equipment ever since. But they haven't been used—at least, not on any important scale.

So may we take heart in the knowledge that once in a while the rules of the game are respected, even if only through fear of retaliation. Somewhere along the line, someone is going to have to start selling the world on the idea of peace. Wouldn't now be a good time?

Peace, and More Homes

Despite the rumblings from Geneva and Indo-China, heating and ventilating people will find cheery news in the housing and construction outlook. Starts of privately owned housing advanced in April to the highest level for any month in more than 3½ years, according to preliminary estimates of the United States Labor Department's Bureau of Labor Statistics.

A 14% rise from March brought the total number of new dwelling units begun in April to 110,000—all but 900 of them privately owned. The rise was general throughout the country, excepting in the Southeast. On a seasonally adjustable basis, private starts have been at an annual rate of more than 1,100,000 for the last three months.

During the first four months of this year the number of privately owned dwelling unit starts exceeded a third of a million (341,400 units), and almost equalled the private total for January-April 1953. During that year the total was swelled by 6% to 346,000 units through an increase in public housing.

Final reports for 1953 show that 1,103,800 new non-farm dwellings were put under construction last year, compared to 1,127,000 in 1952, and 1,396,000 in 1950. A 13% rise in private apartment building in 1953 almost offset moderate declines in one- and two-family housing.

Housing Bill Under Fire

Favorable publicity about the housing situation was being given a lot of attention in mid-May, with Congress considering a new housing bill, and wondering just what to do to prevent a repetition of abuses of certain FHA privileges. Senator Burnet R. Maybank (D-S.C.) says he favors abolishing the Federal Housing Administration's home repair program to prevent racketeers from using FHA for their activities. He contends that repair loans should be made by private financial institutions, without government guarantees.

Testimony before the Committee have brought out that thousands of home owners have been swindled out of millions of dollars by high pressure sales crews which arranged exhorbitant loans, delivered shoddy work, and then skipped town with padded profits. Senator Maybank explained that, despite his personal convictions, he will vote with the Administration for home-repair loans "if they want them continued."

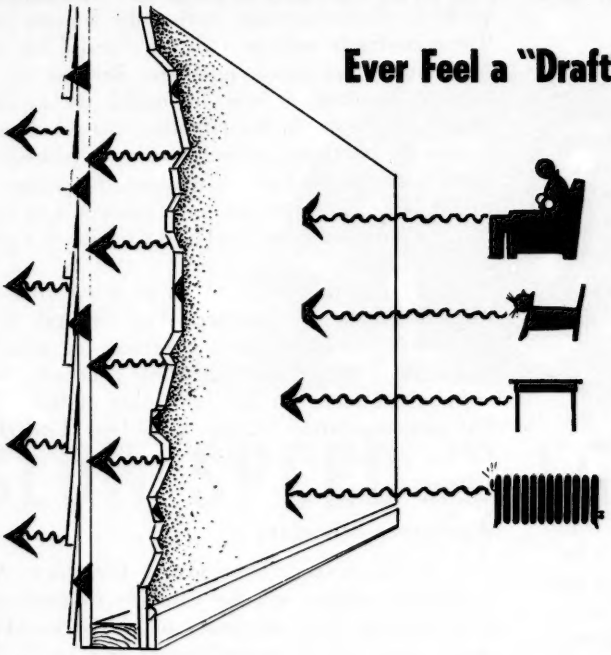
Albert H. Cole, administrator of the Housing and Home Finance Agency, conceded "serious disorders" but added:

"For every developer who has found FHA's over-blown rental financing a happy hunting ground for unearned money, hundreds have found in the FHA a challenge to provide better design, better planning, and better values for the American people."

Heavy Construction Up Too

Contracts awarded for heavy construction in April rose sharply to $1429 million, 1% below the alltime high for the month, set in April 1953. Volume increased 23% over the March total—April having five contract weeks, while March only had four. The April awards pushed the 1954 total to $3906 million, trimming the 1953-54 decline of 34% at the end of the first quarter to 25% at the end of four months. Private construction was responsible for the April rise, with awards climbing to $873 million for a 32% increase over March. Mass housing contracts totalled $100.7 million per week during April—40% above April of last year.

Commercial construction bettered April of 1953 by 12%, setting a new high for the month. Industrial con-



Ever Feel a "Draft" in a Warm, Closed Room?

(RADIATION is the transmission of rays through space. Infra-red heat rays travel at the speed of light, are invisible, have no temperature, only energy. But when absorbed by a surface, they are transformed to HEAT. The surface of any object warmer than absolute zero – the Sun, You, Clothing, Wood, Plaster, an Iceberg, a Stove, a Chair, Paper, an Animal, will RADIATE to a colder surface.)

(CONDUCTION is the process by which warmth flows from a warmer object or particle by direct physical CONTACT, to a cooler one.)

People often complain of "drafts" in a room with air-tight walls and windows. Why? To a large extent because, by Nature's law, warmth *flows* to cold by RADIATION as well as by CONDUCTION. Cold walls, too, draw heat out of contacting air by conduction, causing a downward current of cold air.

The exposed skin of people and the outer surfaces of their clothing lose heat as infra red heat rays flow from them with 90% emissivity to a cooler wall surface which has 93% absorptivity, and transforms the heat rays again to heat. If insulation is lacking, or has settled down, most of this heat is transmitted by radiation to the colder outer wall with 93% emissivity, absorbed, and then dissipated to the colder, outer air. Ordinary materials in the wall space, or a solid wall, augment heat flow by direct conduction.

So people are uncomfortable, perhaps only in spots. More fuel is burned with the hope of obtaining greater comfort. Unnecessarily high, less wholesome temperatures result.

Multiple accordion aluminum in the wall space would retard convection; turn back heat rays with its 97% reflectivity. When plaster is sufficiently warm, no net heat loss radiates from bodies to walls. There is then no current of cold air on the surface of the wall. Comfort is maintained without unduly high temperatures or fuel costs.

In summer, the process is identical except for direction. Heat flow by radiation, conduction and convection is retarded by the multiple sheets of aluminum in the outer wall space. As a result, interiors of rooms stay cooler, and the plaster surfaces are also often cooler than the body. Then by Nature's law that warm radiates to cold, some heat would *leave* the body for the colder wall surfaces, increasing body coolness and comfort.

A *new multiple accordion aluminum, Infra Types 6-S*i* and 4-S*i*, gives edge to edge insulating coverage between beams or studs, forming a continuous "blanket" of uniform depth against heat and vapor flow, and condensation formation. *Patent applied for.

COST OF INFRA INSTALLED
in new construction between wood joists, material with labor,

Type 6-S*i* under 9½¢ sq. ft.
Type 4-S*i* under 7½¢ sq. ft.

INFRA INSULATION INC.
525 Broadway, N.Y.C., Dept. V-6

☐ **Please send samples of new Infra**
☐ **Information**

Name_____
Firm_____
Address_____

INFRA INSULATION, INC., 525 Bway., New York, N. Y.

struction was 60% above March and 22% above April of last year. Total for the year, however, is 55% below the first four months of 1953.

$1.9 Billion Air Force Saving Reported

A tidy little nestegg for the Air Force to use in case developments in Indo-China require stepped up defenses, was reported to the Senate Appropriations Committee by Assistant Secretary of the Air Force H. Lee White. He reported that special economy and savings activities of the Air Force have made possible a direct carry-over of $1.905 billion. This permitted an equivalent reduction in new funds requested by the Air Force for fiscal 1955, starting July 1, 1955.

The actual Air Force carryover of funds from previous appropriations totals $4.058 billion, but $2.153 billion has already been earmarked for 1954 projects. The $1.905 billion is not a carry-over of earmarked funds, but a swing which can be used for new purposes.

General Nathan Twining, Chief of the Air Force, has warned that we may need the extra $1.905 billion, and more too. Speaking of Red air power, he said, "It is by far the biggest air force in the world. In numbers of combat planes it far exceeds the United States Air Force. In fact, the Reds have thousands more combat planes than the United States Air Force, Navy, Marines and Army combined."

As a start toward making up for this shortage, the Department of Defense has asked the Senate to give the Air Force the bulk of a $371 million fund which DOD has asked be restored to the Department's appropriations bill for 1955. A total of $264,524,900 would go to the Air Force if the Senate accepts the Pentagon recommendation. Included would be $60,636,000 for major procurement other than aircraft; $174,483,000 for maintenance and operations; $7,855,900 for military personnel, and $21,550,000 for research and development.

Contract Procedures Revised

Of possible interest to heating and ventilating people who hold or go after government contracts are two new rulings of the General Accounting Office.

First, GAO has approved a proposed amendment to the Armed Forces Procurement Regulations, to provide:

"15-320.4 *Bidding Expenses.* Current bidding expenses of both successful and unsuccessful bids normally will be treated as indirect expenses and apportioned currently to all business of the contractor, in which event no bidding expenses of past accounting periods will be chargeable to defense contracts. However, where it is the contractor's established practice to treat bidding expenses by some other method, such method may be acceptable if the results are considered to be equitable."

The new Regulation would, in effect, overrule a 1953 ruling in which GAO held that a cost-plus-fixed-fee contractor's expenses of submitting unsuccessful contract bids are not reimbursable items of cost.

In a second decision, the General Accounting Office outlines a procedure to be followed by government agencies in computing, for the purpose of reimbursing a nonprofit cost contractor, the fair value of the subcontract work done under arrangements violating the cost-plus-percentage ban.

The new ruling is submitted in response to issues raised by the Army with respect to its handling of nonprofit facilities contracts during the Korean emergency. These contracts were part of the Army's hurried moves to increase munitions facilities. Because of the time element involved, it was impossible to investigate all elements of costs. In this situation, the prime contractors frequently instructed subcontractors to proceed with the work with the understanding that the matter of price would be settled later. In some cases it was understood that the subcontractor would be paid its cost plus a percentage of costs.

In others, prices were to be adjusted after the work was substantially completed. The General Accounting Office has considered such contracts as strictly illegal. The GAO conceded that the prime contractor is entitled to reimbursement for the fair value of the work done. The new regulation (Comp. Gen. Dec. 118109, May 3, 1954), provides a yardstick for determining such fair value.

Washington Miscellany

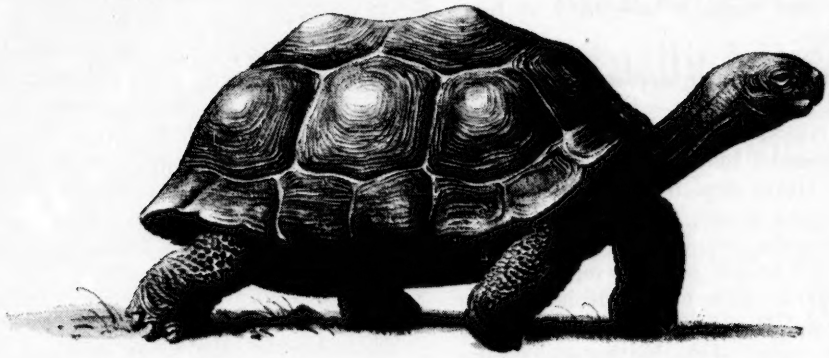
U. S. Government Purchasing Directory. A revised publication which will be valuable to businessmen as long as Uncle Sam continues to be the world's biggest customer for almost everything, is now ready for distribution. For 50 cents a copy, the booklet U. S. Government Purchasing Directory, can be secured from the Superintendent of Documents, Government Printing Office, Washington, D. C. It lists thousands of things bought by military and civilian agencies; gives addresses of buying offices, and suggests ways to make sales.

Electrical-Electronic Symbols Changed. The Defense Department has announced revision of the military standard on electrical and electronic symbols (MIL-STD-15A). The revision makes five basic changes in the previous standard dated October, 1948. By cooperating closely with industry, there are no conflicts with American Standard Y32.2, Graphical Symbols for Electrical Diagrams, which will be issued soon. However, the military standard includes sections on symbols for marine equipment and symbols for electrical equipment in buildings and building distribution systems, not included in the American Standard.

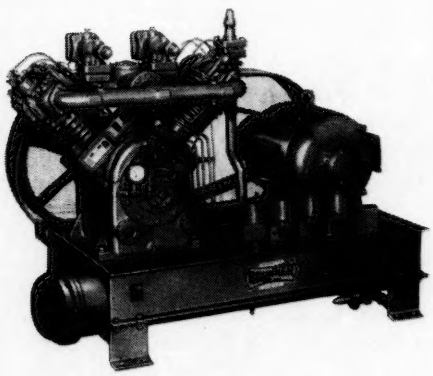
Senate Group Ok's Tanker Lease Bill. To encourage the construction of 20 modern tankers with private funds, the Senate Armed Forces Committee has approved proposed legislation authorizing the Military Sea Transport Service to enter into 10-year charter agreements with private operators. The proposal calls for construction of vessels of 25,000 to 32,000 deadweight tons, with speeds of not less than 18 knots. By means of the leasing agreements, the tankers would be added to the fleet without appropriation of government funds. Their construction would also help to improve employment in shipyards.

Research Expenditures May Be Cut 10%. Despite the uncertainty of the military outlook, a 10% reduction in expenditures for military research is planned for 1955, according to Assistant Defense Secretary Donald A. Quarles. He buffered news of the probable cut with the comment that about one-half of the total research under way in this country is for the Defense Department, Atomic Energy Commission and related defense programs.

in air conditioning, too...



SLOW SPEED *means* LONG LIFE



BRUNNER CONDENSING UNITS

— for remote installation in commercial and industrial air conditioning applications are available in sizes up to 75 H.P. Brunner Compressor Units for use with evaporative condensers also available up to 75 H.P.

SELF-CONTAINED AIR CONDITIONERS

—completely packaged, easy to install and operate, are supplied in various models in sizes 2 H.P. to 20 H.P. — for residential and commercial use.

Why does the turtle live so long?

From an engineering viewpoint, the answer would probably be "Slow Speed!" Because the speed with which things *move* has a vital effect upon their life and usefulness, the design engineer is *always* concerned with doing *more* work with *less* motion.

Famous BRUNNER slow-speed COMPRESSORS are good examples of this principle. Because they operate at speeds much slower than other compressors of the same capacities, Brunner Compressors deliver full capacity air conditioning with *less* costly motion—*less* wear on working parts, *less* maintenance required — and *lower* operating costs, too.

That's one good reason so many architects and consultants specify Brunner equipment on every air conditioning job — for utmost dependability, economy and long-range customer satisfaction. There are *other* reasons, too — so why not get the complete Brunner story? See your Brunner representative — or write us.

BRUNNER MANUFACTURING CO., Dept. K-64, UTICA, NEW YORK
The Brunner Co., Gainesville, Ga.
In Canada: Brunner Corp. (Canada) Limited, Toronto, Ontario

BRUNNER
SINCE 1906

means dependable
air conditioning

BRIEFLY STATED

• R. G. Nordstrom has been named general manager of the Reflectal Corp., New York, a subsidiary of Borg-Warner Corp., Chicago.

• The election of Edwin E. Hokin as president and chief executive officer of Union Asbestos & Rubber Company, and the naming of Norman C. Naylor as chairman of the board, were announced following the annual stockholders meeting. Mr. Hokin steps into the presidency of the company after serving as vice president in charge of the heating and cooling division. He was responsible for the organization of this branch of the company during the past year. Mr. Naylor has served as president of the company for four years. The election of Mr. Hokin signals the further development of the heating and cooling division which, according to Mr. Naylor, is destined to become a major portion of the company's manufacturing activities. John H. Balch has been named executive vice president of the Union Asbestos & Rubber Co. He joined Unarco in 1936 as auditor, has been a member of the board of directors since 1938, when he was also elected secretary of the company.

• Howard L. Clary, who has been assistant general manager of the Bryant Heater Division, Affiliated Gas Equipment, Inc., and who has also been director of sales for that division, has recently been elected a vice president of AGE. Ronald Campbell, who has been assistant to the president of AGE and director of manufacturing for all AGE plants, was also elected a vice president of the corporation.

• A simple inexpensive means has been devised at the Naval Research Laboratory for assembling high-pressure, high temperature A.S.T.M. type 304 stainless steel piping without gaskets. Ease of assembly and disassembly and freedom from contaminating or corroding materials are additional advantages for the principle, which is believed to be capable of extension to materials other than the stainless steel.

• The appointment of Earl Palmer as national sales promotion manager has been announced by the Airtemp Division of the Chrysler Corp. Mr. Palmer for the past two years has held the post of Washington, D. C., regional manager. He originally joined Chrysler Airtemp's sales division in 1948 as district representative for Virginia, Maryland and District of Columbia.

• At a recent annual meeting, the board of directors of Penn Controls, Inc., appointed Ralph S. Penn as president of the company to succeed Albert Penn who was appointed chairman of the board.

• The Air Conditioning Division of the General Electric Company has announced a major expansion of its manufacturing operations in a program to meet the growing demand for its products. The expansion involves the transfer of G.E. home heating and cooling equipment manufacturing out of Bloomfield to plants in Trenton, N. J., and Bridgeport, Conn., according to S. J. Levine, general manager of the Home Heating and Cooling Department. When the expansion program is completed sometime next year, Weathertron and Commercial Products operations will be located at Bloomfield; the Bridgeport plant will produce G-E boilers and related components; and the Trenton plant will manufacture home cooling units and gas and oil-fired furnaces. Home Heating and Cooling Department headquarters will remain at Bloomfield.

• E. W. Seay has been appointed manager of advertising and sales promotion for the new Air Conditioning Division of the Westinghouse Electric Corp. A native of Glens Falls, N. Y., Mr. Seay was educated at Albany Academy and at Williams College, where he was graduated in 1939. He served for a year on the staff of the Radio City Music Hall Corporation in New York, and from 1940 to 1941 as a salesman with Transit Displays, Inc.

• Joseph Raufeisen has been appointed chief engineer of the Brunner Manufacturing Co., Utica, N. Y. He comes to Brunner directly from Wescott and Mapes, consulting engineers, located in New Haven, Conn., where he has been employed for over three years as manager of the mechanical department. A native of Switzerland, Mr. Raufeisen came to the United States after graduating from the Swiss Technology College in Mechanical Engineering. His first American connection in the late 1920's was with McClellan and Junkersfeld who were an engineer consulting firm in New York, later absorbed by the present Stone and Webster.

• Cecil Boling, president of Bush Manufacturing Co., West Hartford, Conn. and its wholly-owned subsidiary, Heat-X-Changer Co., Brewster, New York, has announced two executive advancements in the organization. James A. Mulcahey, director of sales for Bush, has assumed similar duties with Heat-X and henceforth will direct sales efforts of both concerns. Alan Decker has been appointed general manager of Heat-X-Changer Co. Mr. Mulcahey has been director of sales for Bush since 1951. Prior to that, he was connected with the Cecil Boling Co. of New York. Mr. Decker was with the heat transfer sections of the engineering and design department of the Bethlehem Steel Corp. ship-building division for four years before joining Heat-X as chief engineer in 1950.

• An extensive research program on organic and metallic coatings for better protection of steel pipe in aggressive waters, corrosive soils and for handling chemicals, was launched by the Committee on Steel Pipe Research of American Iron and Steel Institute with the assignment of the project to Battele Memorial Institute, Columbus, Ohio. E. R. Mueller of the latter will supervise the research. Initially, a survey is planned of available materials, followed by a study of those that appear to meet requirements and which could be applied at a cost competitive with coatings now in general use.

• The Eighth Short Course on Hot Water and Steam Heating Systems will be held at the University of Illinois, Urbana, Illinois, July 27-30, 1954. Joint sponsors of the course are the College of Engineering, University of Illinois, and The Institute of Boiler and Radiator Manufacturers. The course will be in the nature of an advance course appealing to students who have taken former short courses or who have completed work in the I-B-R School of Modern Heating. Snow melting and summer cooling will be covered.

TWENTY-FOOT LENGTHS of 10" I.D. copper tubes receive final inspection in one of the mills of The American Brass Company. ANACONDA Seamless Drawn Copper Tubes are made up to 26" I.D.

Anaconda Copper Tubes last longer... can actually lower your plant piping costs

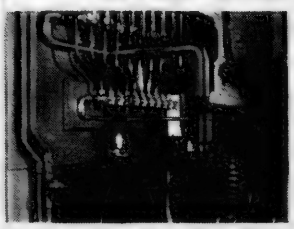
Planning a new installation? Want to replace unsatisfactory piping? Then look into the cost and performance advantages of ANACONDA Copper Tubes *first.* Many plants have found them the *least costly* piping material available.

Here's why: ANACONDA Copper Tubes are light. They come in long lengths. Smaller sizes are bent right on the job. All this means big savings on installation costs. And copper tubes can't rust. They resist corrosion and guard against contamination. Smooth interiors mean smoother flow. Pumping costs are often lower.

Here's another advantage. ANACONDA Copper Tubes — connected with solder-type fittings — can be taken down, moved or have new connections cut in faster than with threaded pipe. *You can meet changing plant conditions easily.*

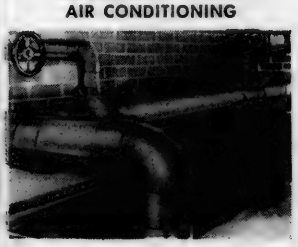
If we can be of assistance in solving a piping problem in your plant please write to: *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Limited, New Toronto, Ont.* 5446

Use Anaconda Copper Tubes for:

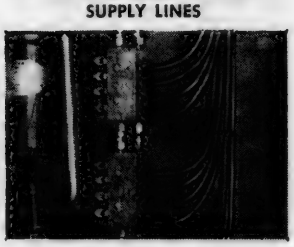


REFRIGERATION AND AIR CONDITIONING

HOT AND COLD WATER SUPPLY LINES



INDUSTRIAL HEATING LINES



AIR, LUBRICATING AND HYDRAULIC LINES

for copper piping call an

ANACONDA®

Distributor

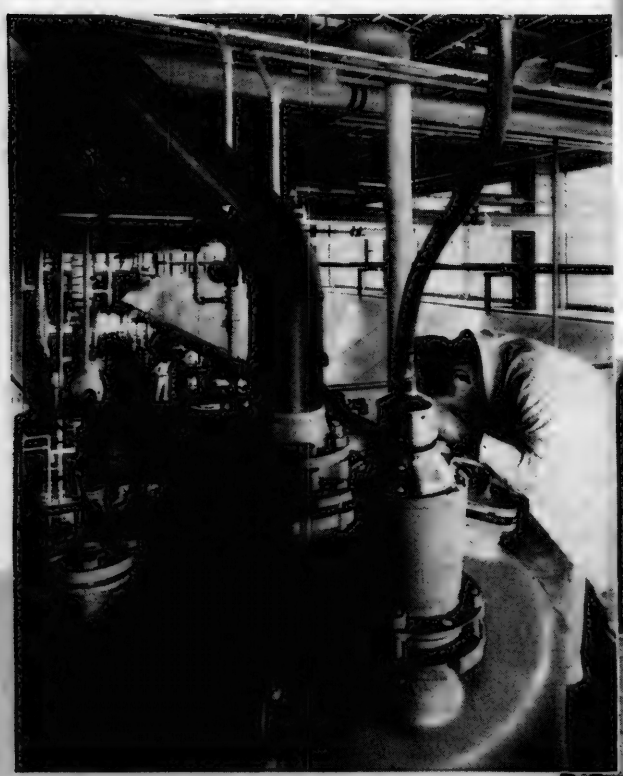
ARMOUR'S NEW LABORATORIES *producing*

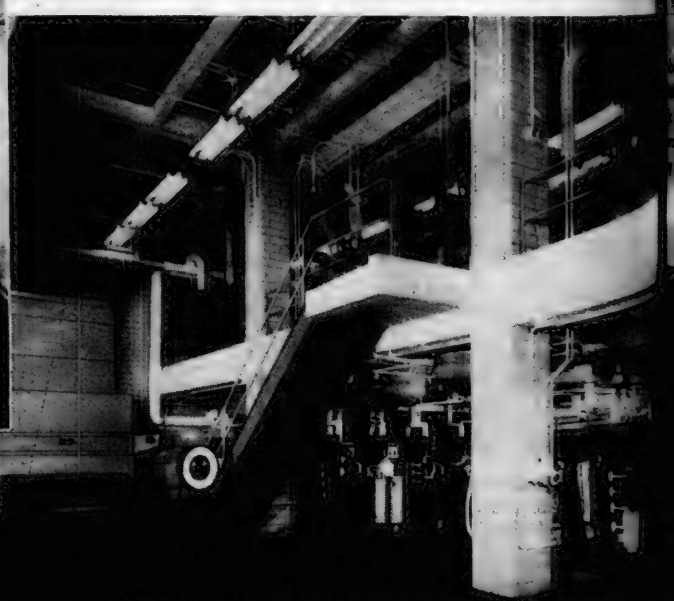
Left: **Parenteral Packaging Department.** One of the areas completely air conditioned.

POWERS CONTROL — TEMPERATURE AND HUMIDITY

Above: **Hospital Gowned and Masked Technicians i Bulk Sterile Filling Area.** Here the air conditioning i treated in such a manner that aseptic operations could be undertake with least possibility of bacterial contamination.

Below: **Low Temperature Human Blood Fractionation Plant** – th *largest in the U.S.A.* In this area there are processed 18,000 pints o human blood (or the equivalent of human plasma) weekly into Norma Serum Albumin and Poliomyelitis Immune Globulin. Processes are co trolled by Powers V-Port FLOWRITE Valves. This entire room is accurate held at 23° F.

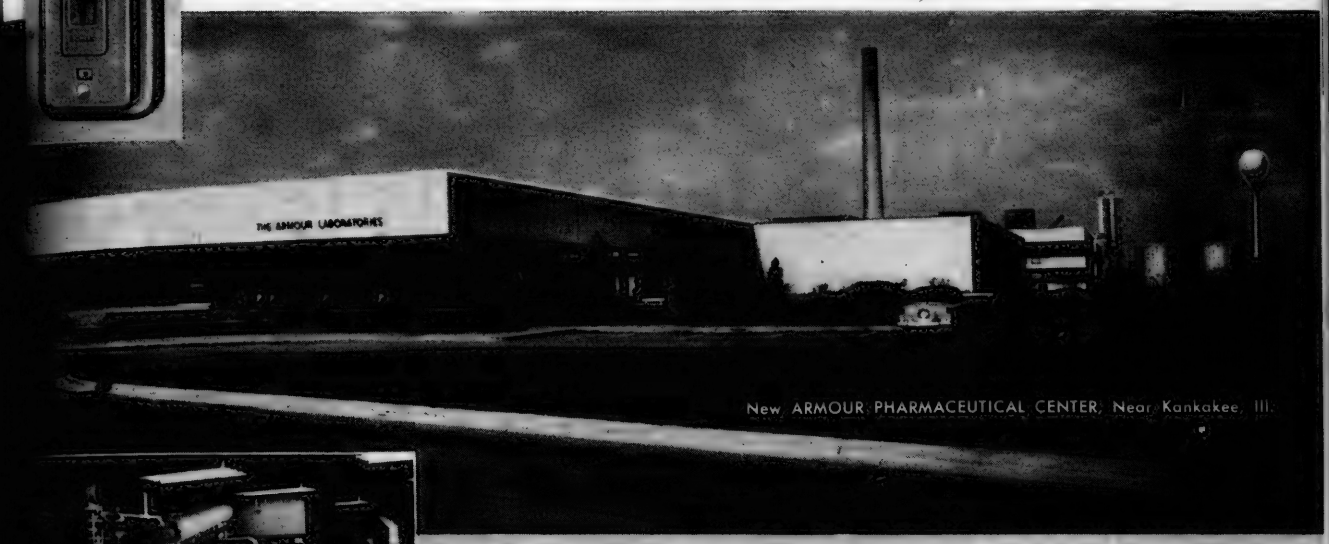




Above: **View in Parenteral Manufacturing Building No. 4** where ACTHAR, Insulin, and Intrinsic Factor (BIO-PAR) are processed. Processes here are also controlled by Powers V-Port FLOWRITE Valves.

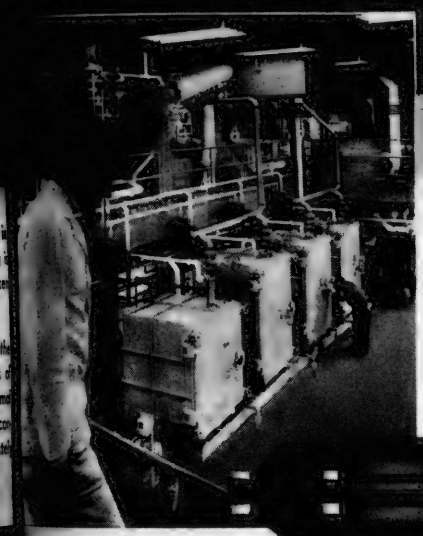
Gamma Globulin and other pharmaceuticals...

Use POWERS AIR CONDITIONING CONTROL AND FLOWRITE DIAPHRAGM VALVES



New ARMOUR PHARMACEUTICAL CENTER, Near Kankakee, Ill.

Architects & Engineers: HOLABIRD & ROOT & BURGEE
Piping Contractor: M. J. CORBOY CORP.



Gamma Globulin for Combating Polio, Serum Albumin used by the Armed Forces for transfusion in shock and burn cases, Thyroid powder and tablets, Intrinsic Factor (BIOPAR), Insulin and ACTHAR for treatment of arthritis — production of these and many other Armour products requires accurate temperature control.

To insure the precision control of air conditioned areas in their modern $12 million plant Armour installed a Powers pneumatic control system. To accurately control the flow of heating and cooling mediums and vacuum used for various processes, they installed Powers V-PORT FLOWRITE Valves.

When you have a control problem requiring the dependable performance assured by Powers products — call our nearest office or write us direct.

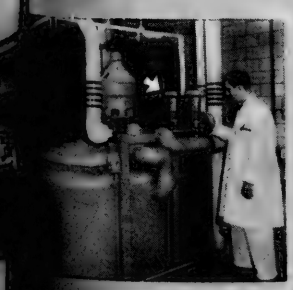
THE POWERS REGULATOR CO.

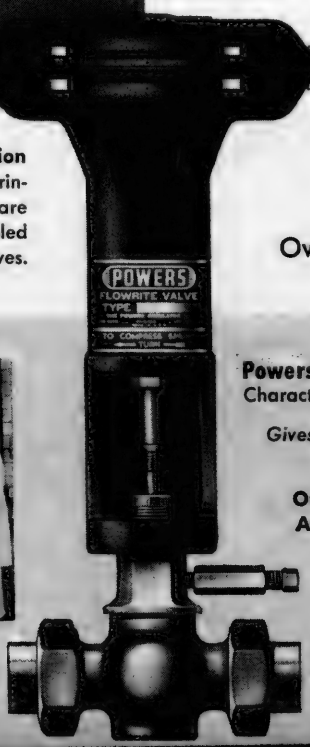
SKOKIE, ILL. • Offices in Over 50 Cities in U.S.A., Canada and Mexico

Over 60 Years of Automatic Temperature and Humidity Control

(b70)

...ove: View in Solvent Extraction ...ilding No. 5 where Insulin, Intrin... Factor and Injectable Liver are ...duced. Processes are controlled ... Powers V-Port FLOWRITE Valves.

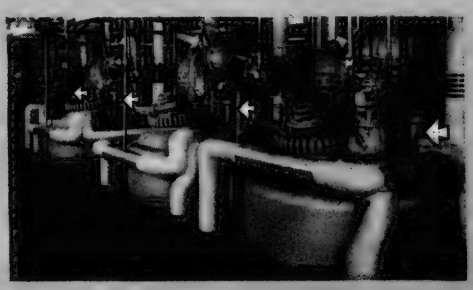




Powers FLOWRITE Valve
Characterized V-PORT Type

Gives BETTER Control with Less Maintenance

Over 100 are Used in Armour Laboratories.



...TELY CONTROLS STEAM, WATER, VACUUM AND PROPYLENE GLYCOL AT ARMOUR LABORATORIES

65° below to 2500° above today i

New Trane laboratory creates "terrible weather" . . . an

. . . for industry, hom

Cold as Siberia—or the stratosphere! This room, capable of creating 65-degrees-below-zero cold, is designed for testing the performance of TRANE equipment at low temperatures. Here, a radar tube cooler test set-up is being checked under conditions it might face in some bitterly cold Arctic plane-spotting station.

2,500 degrees above in this atmosphere-controlled furnace! Within a furnace may be developed new types of heat exchangers to w efficiently under the ever-climbing temperatures of new proce much as TRANE Brazed Aluminum Surface was developed to pro a more compact, light-weight exchanger for special uses.

Chamber of silence, where a whisper is a "shout." In this soundproofed room, technicians check quiet operation of TRANE products. High standards of noise-free operations are vital.

Room-within-a-room is for rating TRANE heating equipment. Refrigerated air is circulated within the double wall, simulating winter conditions. You get assurance of *full* rated capacity from *every* TRANE unit.

More than a dozen wind tunnels provide the wide range necessary to test all types of TRANE (and other) equipment. A continuous, long-term testing program provides the complete and authoritative performance data that has made TRANE sales engineers in 90 U. S. offices and throughou world a dependable source of he information . . . and helps make T literature outstanding in the ind Look to TRANE for the answe your heating, cooling and venti problems.

La Crosse, Wis., and 60 m.p.h. gale!

new machines to overcome it
and the nation's defense!

New TRANE Research and Testing Laboratory

WITHERING HEAT of a mile-deep African gold mine . . . the numbing cold of an Arctic military post . . . or super-temperatures encountered in new industrial processes—you may find them duplicated, any day, in the new "House of Weather Magic" at La Crosse, Wis.

It's the new TRANE Research and Testing Laboratory, an investment in time, talent and the tools of research for developing better equipment—new methods of heating, air conditioning, ventilating, heat transfer.

TRANE leadership in these fields stems from such research—research which has produced such outstanding new products as the TRANE *CenTraVac* (hermetic, centrifugal water chiller) . . . *UniTrane* multi-room air conditioning units . . . the TRANE *Unit Ventilator* for schools . . . *Delta-Flo* Heating and Cooling Coils, and many others.

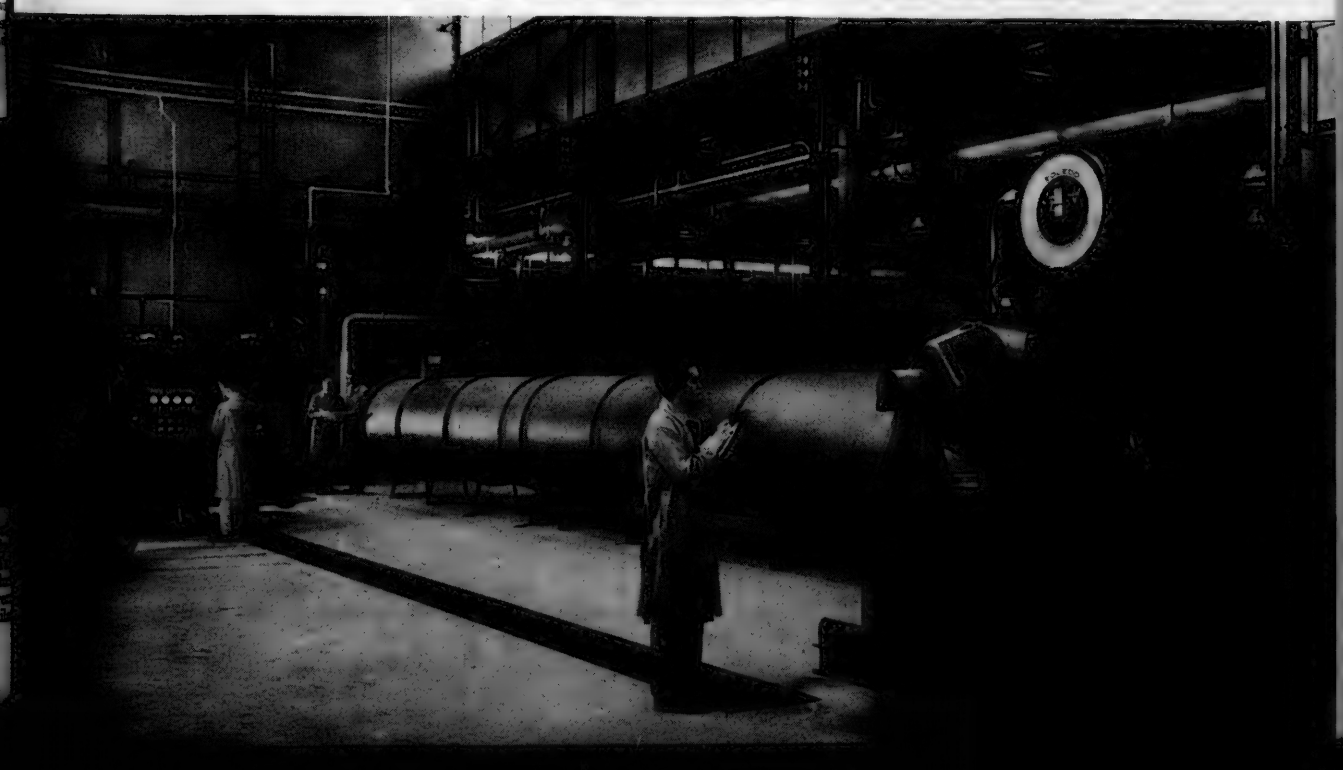
For complete information on the wide range of TRANE air conditioning and heating products, call your nearest TRANE Sales Office or write The Trane Company, La Crosse, Wis.

TRANE

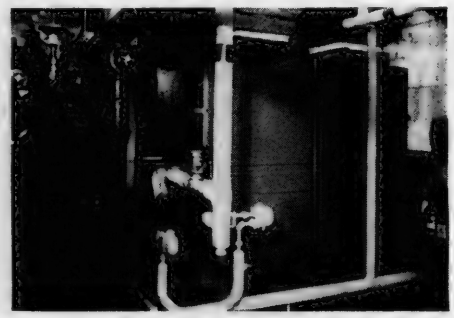
manufacturing engineers of
AIR CONDITIONING, HEATING,
ventilating and heat transfer equipment

The Trane Company, La Crosse, Wis. • East. Mfg. Div., Scranton, Penn.
Trane Co. of Canada, Ltd., Toronto • 90 U.S. and 14 Canadian Offices

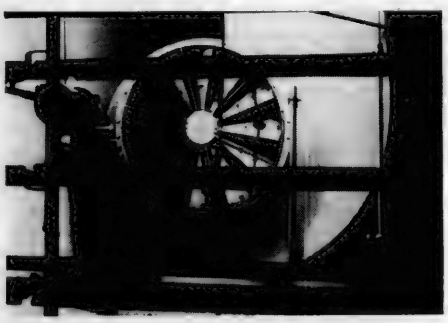
"Big Bertha" is the nickname given this duct used for testing large centrifugal fans. Test set-ups like this provide accurate ratings for TRANE Fans, help engineers in their never-ending search for more efficient designs, lower horsepower requirements.



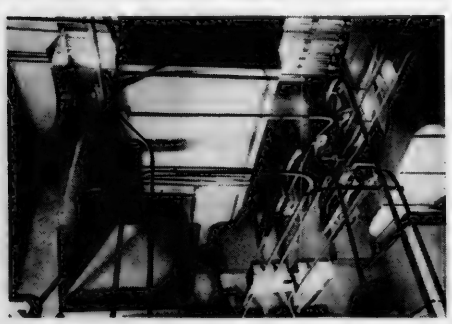
Basement – Sirocco Fans circulate fresh, dehumidified air. Total rating of American Blower equipment in building is 770,378 cfm. Gross floor area is 503,000 sq. ft.



2nd floor – The Prudential Building uses 10 American Blower Air Conditioners like this one in its mammoth air-circulating, cooling and dehumidifying installation.



5th floor – One of 50 American Blower Supply Fans that furnish air to various offices. Other equipment includes: American Blower Heating & Cooling Coils, Utility Sets.



20th floor – A group of four powerful Sirocco Exhaust Fans in a louvered section of the Prudential Building's 20th floor help get rid of stale air from the many offices.

American Blower Equipment Keeps Prudential Comfortable

The completely air-conditioned 21-story Southwestern Home Office of the Prudential Insurance Company of America in Houston, Texas, is a credit to the company and to the area it serves.

American Blower fans, heating and cooling coils, air-conditioning units, and heating and ventilating units, all serve to condition and circulate air to the occupied spaces of the building in accordance with the carefully thought out plans of the consulting engineers, Dale S. Cooper & Associates.

Why was American Blower selected?

W. A. Harbaugh of Straus-Frank Co., mechanical contractors, states: "I can depend on American Blower service and the performance of their equipment—and that is worth money to me."

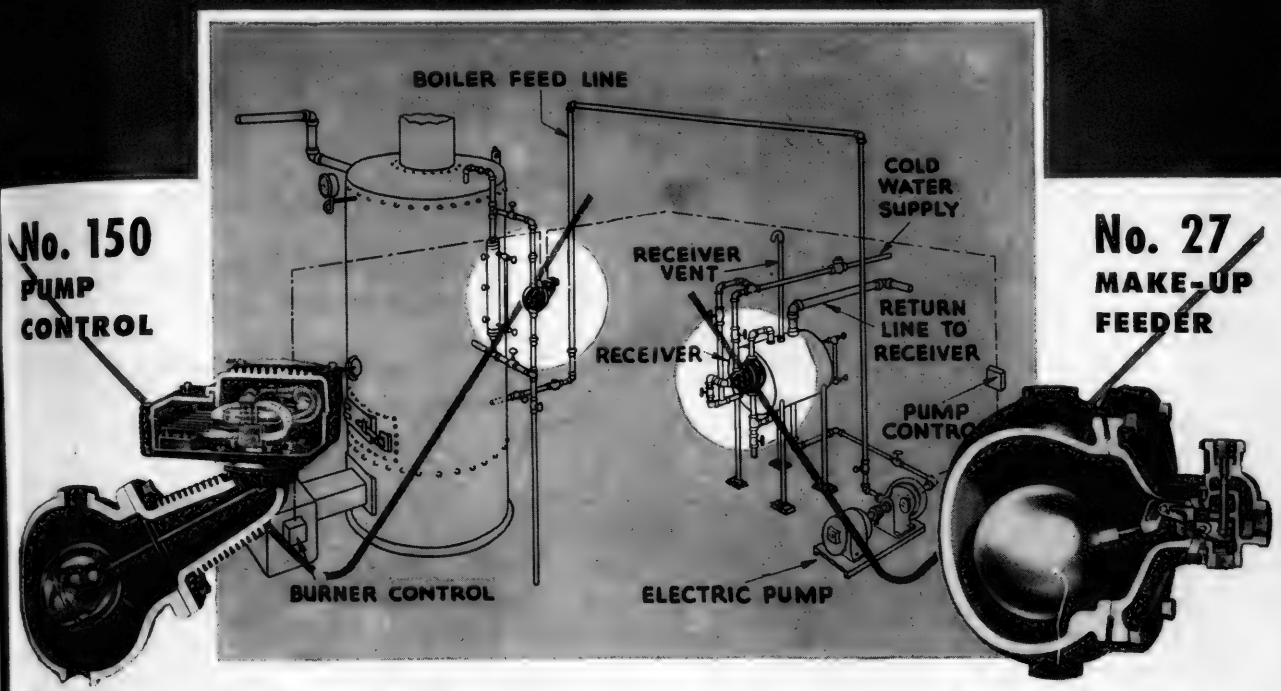
You, too, can depend on American Blower. If you have an air-handling problem, call your nearest American Blower or Canadian Sirocco Branch Office. American Blower engineers have a complete knowledge of the air cycle, and can supply the equipment to meet the special problems of many industries.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO
Division of American Radiator & Standard Sanitary Corporation

AMERICAN BLOWER

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

Here's the GREAT COMBINATION for those Medium Pressure Boilers



No. 150 PUMP CONTROL

No. 27 MAKE-UP FEEDER

Pump Control, Low-Water Fuel Cut-off and Low Water Alarm

The No. 150 has two mercury switches. One provides a circuit for starting and stopping feed pump; the other has circuits for low-water cut-off of the burner and for low-water alarm bell if desired. Underwriters' approved.

It is built throughout to stand up under pressure and temperature encountered in boilers of any type or size; maximum steam pressure, 150 lbs. It has no stuffing boxes to cause trouble. Packless construction is provided by extra-heavy monel sylphon bellows. Switch leads have heat-impervious, porcelain-bead insulation. Mechanism is sealed to guard against tampering. Thousands of installations attest the dependability of this control.

How to use them . . .

This is the team of thoroughbreds that takes all the worries and troubles out of water level and feed pump control for medium pressure boilers—boilers with steam pressures up to 150 psi.

The drawing above shows the simple hook-up. The No. 150 controls the boiler feed pump directly from the boiler water level. This holds the boiler water level within close limits that assures maximum steaming efficiency and fuel economy. Any deficiency in the returns is at once replaced by the No. 27 Make-up Water Feeder on the receiver.

An extra switch on the No. 150 provides circuits for cutting off burner and sounding low water alarm in the event of some emergency such as current interruption in the pump circuit or failure of make-up water supply.

Yes, this set-up gives you close control of the water level and maximum protection from low water. Ask for simple installation and wiring diagrams.

Float-operated make-up water feeder for receiving tanks

The No. 27 is used to supply make-up water to maintain the minimum water level required in condensate receiving tanks. Its large water feeding capacity makes it particularly effective in this service. Rugged, all bronze and stainless steel valve mechanism assures long life. The diagram shows how the No. 27 is installed with 1-inch equalizing pipe and ¾" water feed pipe. Every detail of the No. 27 speaks quality construction. It is for tank pressures up to 35 lbs. and water supply pressure up to 100 lbs. Other well-built McDonnell Make-up feeders are available to meet almost all installation conditions.

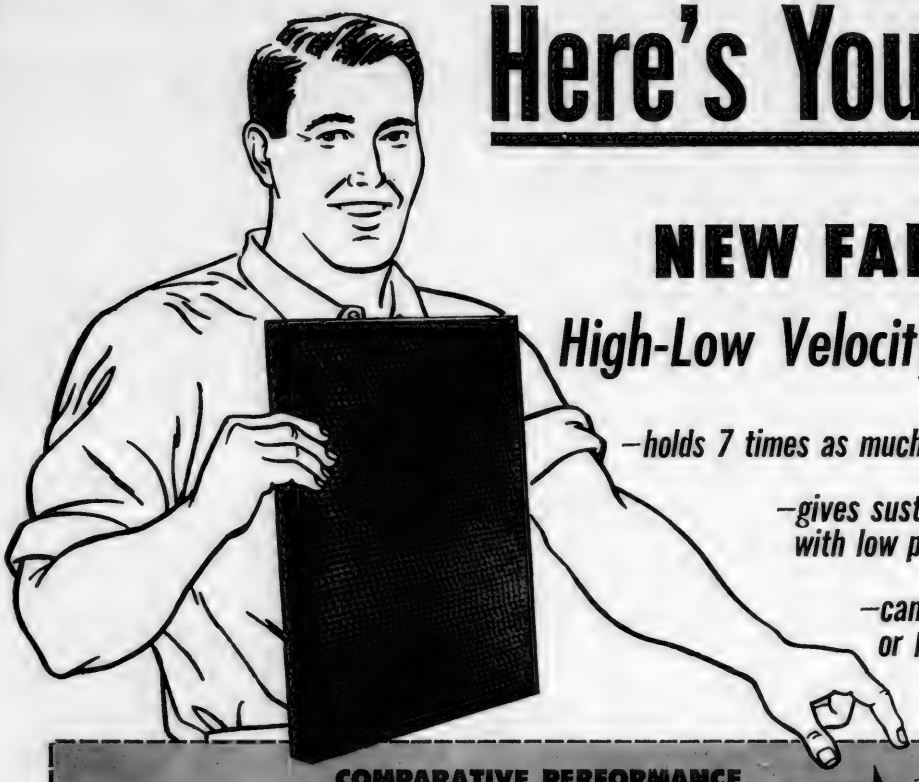
McDONNELL & MILLER, *Inc.*, 3500 N. Spaulding Ave., Chicago 18, Ill.

Doing One M&M *Thing Well*

Your Jobber Stocks Them

McDONNELL

Here's Your Proof!

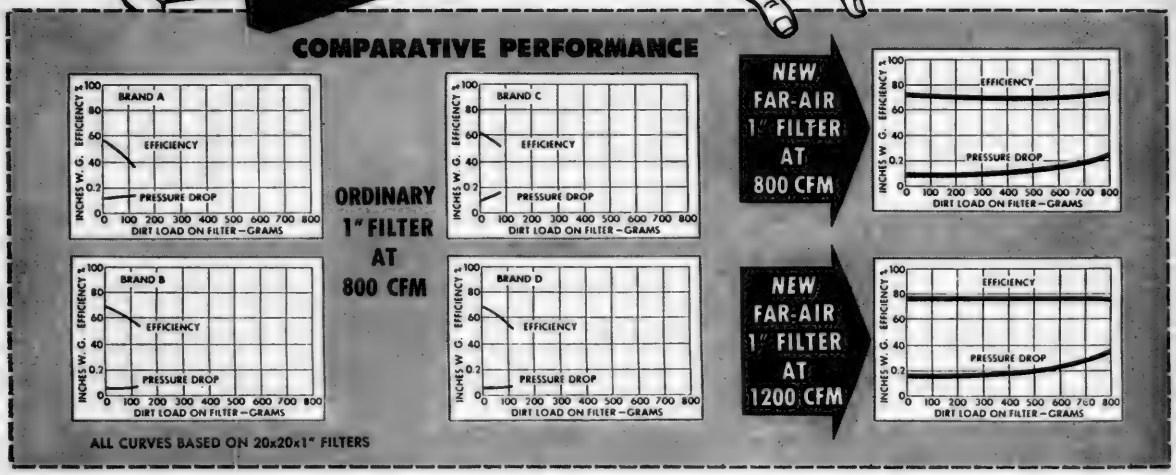


NEW FAR-AIR®
High-Low Velocity 1" FILTER

—holds 7 times as much dirt as ordinary filters

—gives sustained high performance with low pressure loss

—can be used at either high or low velocity



These graphs show actual performance of the new FAR-AIR High-Low Velocity 1" Filter as compared to performance of ordinary types under identical conditions. In addition, it delivers half-again as much clean air because of 50% greater capacity.

Permanent, scientifically designed and ruggedly built, it eliminates the necessity for never-ending replacements. No longer need you put up with poor performance as ordinary 1" filters approach the useless point.

Because it loads progressively, it gives you high efficiency air filtration without critical pressure loss right up to cleaning time. Cleaning is simple and easy. With reasonable care it will last indefinitely.

Here at last is the new-type filter all industry has been waiting for. It means higher quality performance from ⅓ less space, with literally negligible service requirements.

Eliminate the wasteful expense of inefficient filters —save time and trouble—get better air filtration at lower cost. Write today for complete information. Farr Company, P. O. Box 10187, Airport Station, Los Angeles 45, California.

ORIGINATORS OF FAR-AIR CERTIFIED FILTER SERVICE

FARR COMPANY

NO COMPROMISE ON QUALITY

Los Angeles, New York, Chicago, Memphis

MANUFACTURED UNDER LICENSE BY FARR COMPANY MANUFACTURING LTD., MONTREAL, CANADA

Better by FARR — Better buy FARR

is something
ALWAYS
missing?
(to cut your profit)

...then switch to the one line that meets every selling need

* **EXAMPLE No. 4:** You gain three advantages—*profitwise*—when you sell the Bryant line. First, because it's a *quality* line, Bryant discount structures are arranged to give you the highest and broadest profit margins. Second—and again because it's a quality line—Bryant protects your earnings against profit-shrinking "call backs". Last, because it's the most complete line of heating, air conditioning and water heating equipment in the industry, Bryant gives you *more* opportunities to make sales—*and profit!*

Your nearby Bryant Distributor has complete details. It will pay you to call him today.

bryant®

HEATING | AIR CONDITIONING | WATER HEATING

1. The most complete line in the industry
2. Quality products—Competitively priced
3. Established name—Good customer acceptance
* 4. Broad, attractive profit margins
5. Local Distributor warehousing and service
6. Factory district representatives and traveling sales training and service teams

Bryant Heater Div., Affiliated Gas Equipment, Inc., 17825 St. Clair Ave., Cleveland 10, Ohio

Depend on LADISH

To Meet All Your Fittings Needs With an Unsurpassed Range of Sizes and Materials

L
TO MARK PROGRESS

1 BUTT WELDING FITTINGS

2 A.S.A. FORGED FLANGES

3 FORGED SCREWED OR SOCKET WELDING FITTINGS

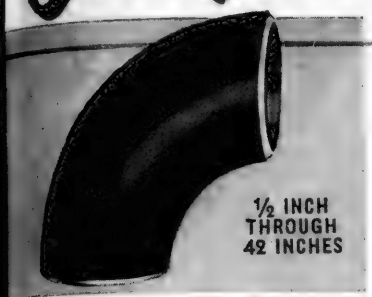
4 T.E.M.A. HUB & RING FLANGES

5 LONG WELDING NECKS

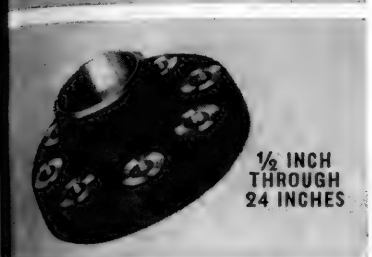
6 LARGE DIAMETER FLANGES AND RINGS

Available in...

Complete Service . . .



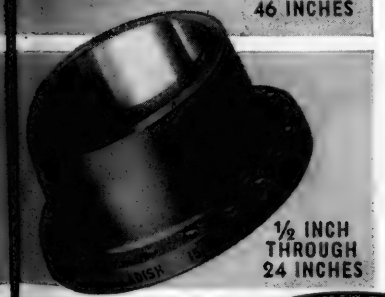
½ INCH THROUGH 42 INCHES



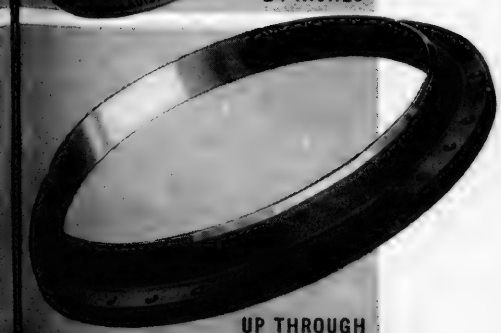
½ INCH THROUGH 24 INCHES

⅛ INCH THROUGH 4 INCHES

6 INCHES THROUGH 46 INCHES



½ INCH THROUGH 24 INCHES



UP THROUGH 20 FEET O.D.

IRON, STAINLESS AND ALLOY STEELS, ALUMINUM, NICKEL AND OTHER FERROUS AND NON-FERROUS METALS

To Meet Your Entire Fittings Needs with a Line Complete In All 6 Major Types

For dependable service that results from an ideal combination of broad line and ample stock . . . specify and buy LADISH . . . the Controlled Quality line that offers a complete range of sizes, types, weights, pressure ratings and materials needed for virtually any piping installation. Your local Ladish distributor's ample stock is backed by complete factory inventories to keep your piping jobs on schedule. So, for *complete service* in fittings . . . specify and buy LADISH.

For your new 304-page Ladish Fittings Catalog, No. 55 contact your Authorized Ladish Distributor, your local Ladish District Office, or write to Ladish Co., Dept. HV, Cudahy, Wis.

THE COMPLETE *Controlled Quality* FITTINGS LINE
PRODUCED TO ONE STANDARD OF UNSURPASSED QUALITY

LADISH CO.

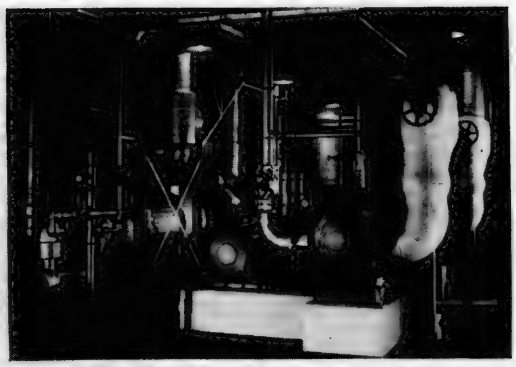
CUDAHY, WISCONSIN
MILWAUKEE SUBURB

District Offices: New York • Buffalo • Pittsburgh • Philadelphia • Cleveland • Chicago • St. Paul
St. Louis • Atlanta • Houston • Tulsa • Los Angeles • San Francisco • Havana • Mexico City • Brantford, Ont.

BAKER and FULLER COMPRESSOR operated by

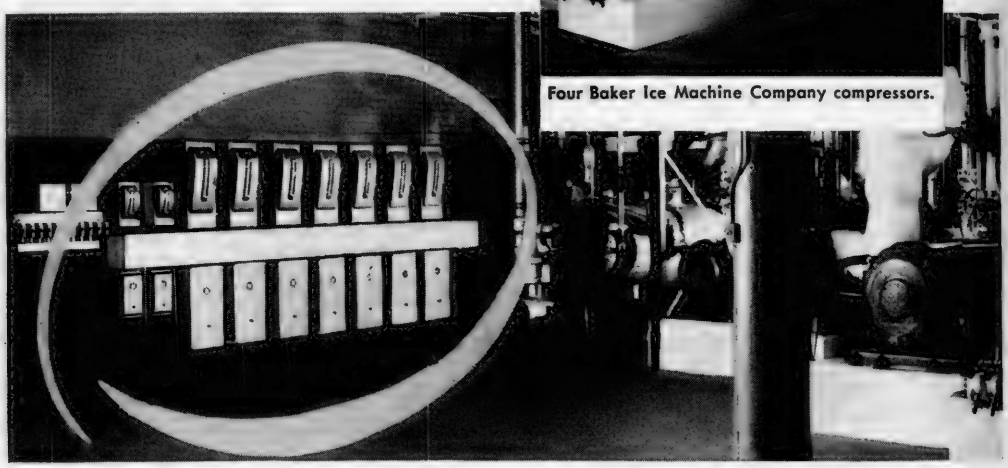
ALLEN-BRADLEY

TROUBLE FREE MOTOR CONTROLS



Three Fuller rotary booster compressors.

Four Baker Ice Machine Company compressors.



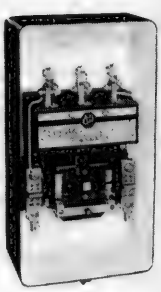
Baker and Fuller compressors controlled by Allen-Bradley at Continental Freezers of Illinois, Inc., Chicago.

Why are Allen-Bradley starters so popular for refrigeration and air-conditioning service? . . . Because they do not require regular attention—they are trouble free. Only ONE moving part. No pivots, pins, or bearings to corrode or stick . . . no jumpers to break. You install them . . . and forget them!

No contact maintenance . . . Allen-Bradley double break, cadmium silver alloy contacts never need cleaning, filing, or dressing. Allen-Bradley thermal relays are dependable and remain accurate in their operation, even after long service.

The Allen-Bradley trademark stands for millions of trouble free operations. Install Allen-Bradley motor controls in your equipment, today, for rugged, reliable performance.

Allen-Bradley Co., 1330 S. Second St., Milwaukee 4, Wis.



Allen-Bradley Bulletin 709 Solenoid Starter, Size 4.

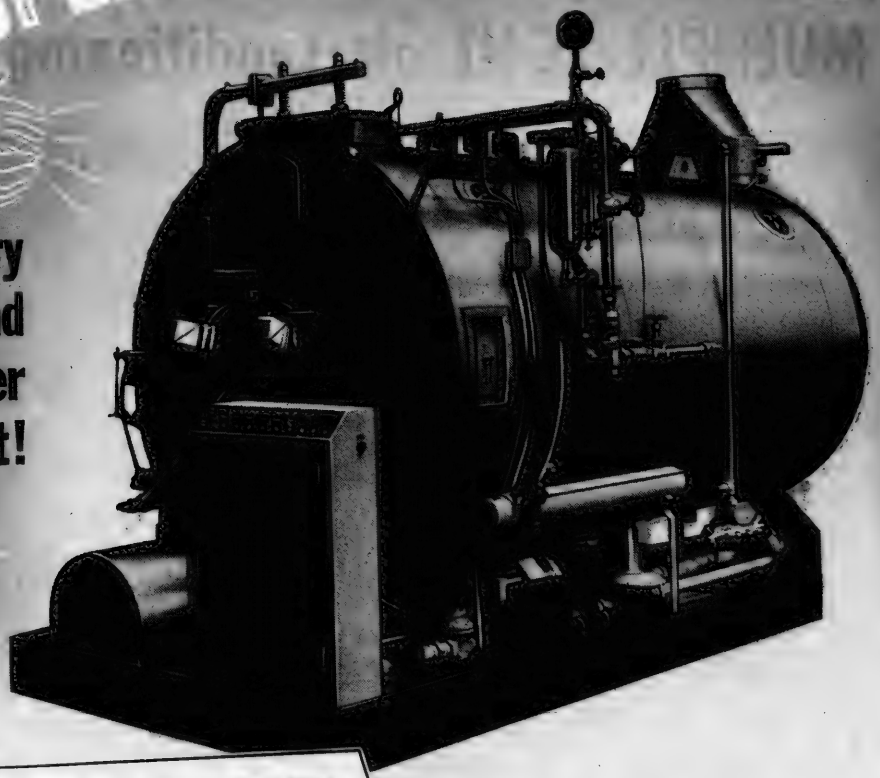
A-B Quality

ALLEN-BRADLEY SOLENOID MOTOR CONTROLS

QUALITY MOTOR CONTROLS FOR HEATING, VENTILATING, AIR CONDITIONING, & REFRIGERATION INDUSTRIES

SUPERB PERFORMANCE

on every heating and power assignment!



TITUSVILLE TICOSTEAM

PACKAGE STEAM GENERATOR

For factories, stores, hospitals, apartments, office buildings—wherever high-efficiency heating and power are a special consideration—specify and install TICOSTEAM for dependable satisfaction! A complete steam plant, equipped with every safety feature, this outstanding unit is *Titusville* in top quality and performance on the job. Request our descriptive Bulletin B-3100.

For light oil, and light oil and gas

Heavy oil, and heavy oil and gas

Natural or manufactured gas

TITUSVILLE IRON WORKS CO TITUSVILLE, PA.

A DIVISION OF Struthers Wells

THE TITUSVILLE IRON WORKS COMPANY

TITUSVILLE, PENNSYLVANIA

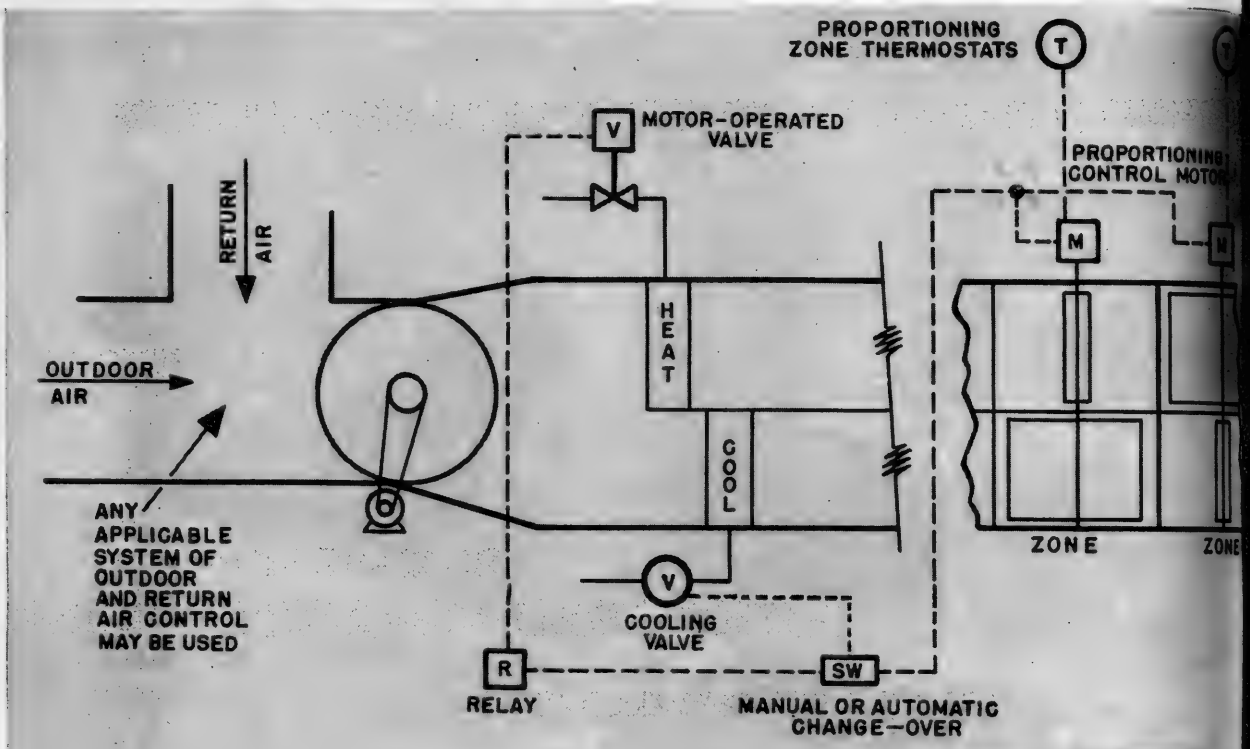
Manufacturers of **A COMPLETE LINE OF BOILERS FOR EVERY HEATING AND POWER REQUIREMENT**

BARBER COLMAN

ELECTRIC

Automatic Controls

...provide low-cost, most effective control of MULTIPLE-ZONE air conditioning systems



The modern answer to heating and cooling of commercial and public buildings

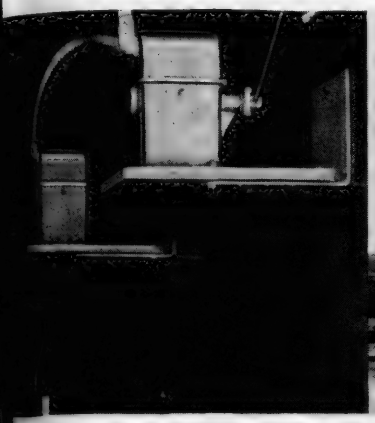
Most leading air conditioning equipment manufacturers now have available "packaged" blow-through units to heat and cool one or more zones of commercial and public buildings, or different floors of the same building. Using either hot water or steam, and chilled water or direct expansion coils, the single unit provides comfortable warmth or refreshing cool air in varying degrees to each zone, depending upon the season, internal loads, solar exposure, and requirements of the occupants.

Barber-Colman "Control Centers" serve as central junction boxes, house prewired accessories and numbered terminal strips for connecting all electrical components. Wiring is simplified, installation costs decreased, servicing minimized, operation improved.

Utter flexibility of temperature control from one compact unit is the outstanding advantage of multiple-zone, blow-through, fan coil units. Starting with a proportioning thermostat (B-C Microtherm) in each zone to position a proportioning damper motor, the control system can be designed to meet with individual requirements of each installation. A motor-operated valve in the supply line to the heating coil opens and closes as the damper motors are actuated. Or a dual bulb outdoor reset control can be used to vary temperature in the hot deck in accordance with outdoor temperatures.

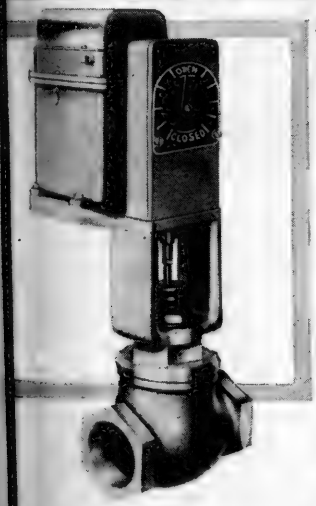
Supply to cooling coils is similarly controlled by a valve which opens and closes upon demand from the damper motors. The cooling valve can be interlocked with the fan motor to open only when the fan is running.

Manually operated, or automatic summer-winter switches contribute to quick change-over of the unit. Any applicable system of outdoor and return air control can be incorporated. With the low-cost, remarkable flexibility of electrical controls . . . and with the guidance of nearby Barber-Colman application engineers in laying out systems . . . the multiple-zone air conditioning system provides economical, practical, year 'round comfort.



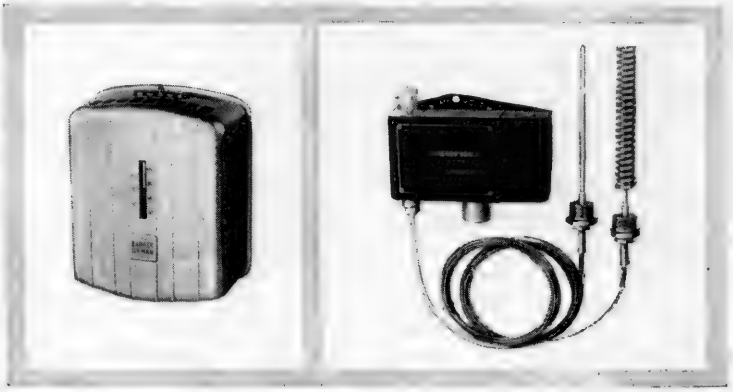
Barber-Colman Control Motors, "standard of the industry," operate dampers on 3-zone, blow-through heating and cooling unit. Oil-submerged mechanism lasts for decades. Proportioning-type.

International Business Machines Building, Grand and Lindell, St. Louis, has Trane 3-zone Climate Changer operated by Barber-Colman Automatic Controls, complete with "Control Center." Building houses branches of IBM and Great Lakes Carbon Co. Heating and air conditioning contractor was John C. Murphy Company.



(Left) Motor-Operated Valves provide control of steam, hot water, or chilled water.

(Right) Room Microtherm provides proportioning control of heating and cooling system, summer and winter. Accurate, reliable, with handsome champagne gold-finished cover.



NEW LITERATURE KIT!

Based upon research and experience with multiple-zone systems, Barber-Colman has assembled a kit of literature visualizing several types of automatic electric control systems. Write for your kit, or call your nearby Field Office (consult telephone directory) for help on your problem.

Dual Bulb Outdoor Reset Control varies air temperatures in hot deck in accordance with outdoor temperature changes

BARBER COLMAN

ELECTRIC

Automatic Controls

BARBER-COLMAN COMPANY, ROCKFORD, ILLINOIS

Automatic Controls • Air Distribution Products • Industrial Instruments
Aircraft Controls • Small Motors • OVERdoors and Operators • Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

BARBER-COLMAN COMPANY, Dept. F, 1302 Rock St., Rockford, Ill.

☐ Please send free Kit on Automatic Electric Controls for Multiple-Zone Air Conditioning Systems.

Name_____

Firm Name_____

Address_____

City_____ State_____

You don't have to hide

If you have installed

PETRO

OIL or GAS HEATING

Heating contractors know PETRO equipment gives dependable, economical service

It's a happy occasion when you meet old customers if you have sold them Petro heating. Chances are, they're back to tell you how much they enjoy the comfort and economy of their Petro heating . . . and to give you the names of friends who are prospects. For no other heating gives such outstanding service and fuel economy . . . no other equipment is more simple in construction or trouble-free in service.

Yes, for over 51 years heating and plumbing contractors have found Petro a quality and profitable line to sell. Why not send for complete information?

Petro, 3050 West 106th St., Cleveland 11, Ohio.
In Canada: 2231 Bloor St. West, Toronto, Ont.

Residential Oil and Gas Burners, Oil and Gas Furnaces and Boilers, Industrial and Commercial Oil, Gas and Oil-Gas Combination Burners

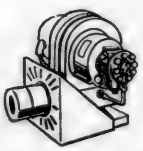
PETRO

T.M. REG. U.S. PAT. OFF.

OVER 50 YEARS OF LEADERSHIP IN AUTOMATIC HEATING AND POWER EQUIPMENT

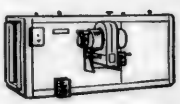
Oil and Gas Furnaces and Boilers

Made in popular sizes to fit heating needs of homes from 4 to 10 rooms. Extremely compact.



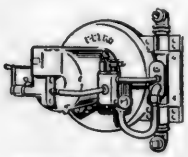
Conversion Oil Burners

Sizes for residential or commercial use. Easily installed on existing furnaces or boilers. Capacities to 20 gallons per hour.



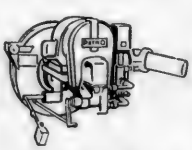
Horizontal Oil Furnace

Hang it or hide it—this winter air conditioner fits anywhere. Available in 5 models from 80,000 to 180,000 Btu's (output at bonnet).



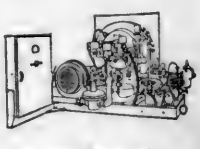
Industrial Oil Burners

Rotary type. Burn low-cost heavy fuel oil with complete reliability. Capacity up to 200 gals. per hour. Fit most any boiler.



Combination Oil-Gas Burners

The answer to seasonal fuel shortages and price advantages. Switch fuels in a matter of minutes.



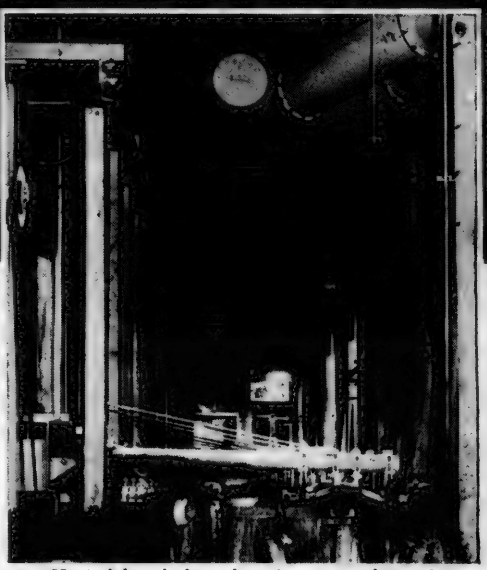
Complete Packaged Unit

For oil, gas, or both. A complete combustion system in which all elements are correctly balanced. Simply bolt on boiler front.

Joy fans are installed in the ducts for greater efficiency, easier installation, and economy of floor space.

PLATING LINE VENTED BY JOY AXIVANE® FANS

Corrosive Air Removed in Jig-time By "In-the-Duct" Installation of Exhaust Fans



Vertical branch ducts draw fumes into the trunk line for ultimate discharge into the atmosphere.

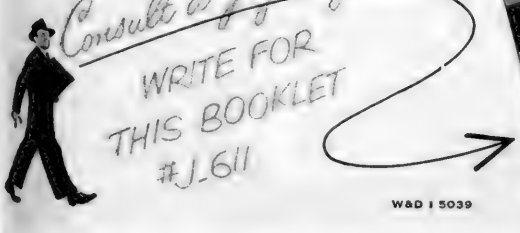
An interesting, and necessary, feature of the new zinc and cadmium plating line at Appleton Electric Company, Chicago, is the compactness of the Joy Axivane Fan exhaust system.

This exhaust system carries off the hot, corrosive air from the plating line up to the roof where it is discharged into the atmosphere.

Centrifugal units would have necessitated an expensive modification in the building structure, in addition to a larger, more complicated duct system.

The compact, in-line design of the Joy Axivane Fans permitted installation *right in the ducts* on the floor above the plating line. Floor space was saved, installation costs were drastically reduced, building structure did not have to be altered, and a much smaller and simpler duct system was constructed!

Joy Axivane Fans will show you new standards in efficiency, compactness, quietness, and outstanding versatility. There are 136 models . . . all with adjustable blades . . . for volumes up to 300,000 CFM and pressures to 11″ wg. Get the full story on Joy Fans by writing for Bulletin J-611, TODAY. ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

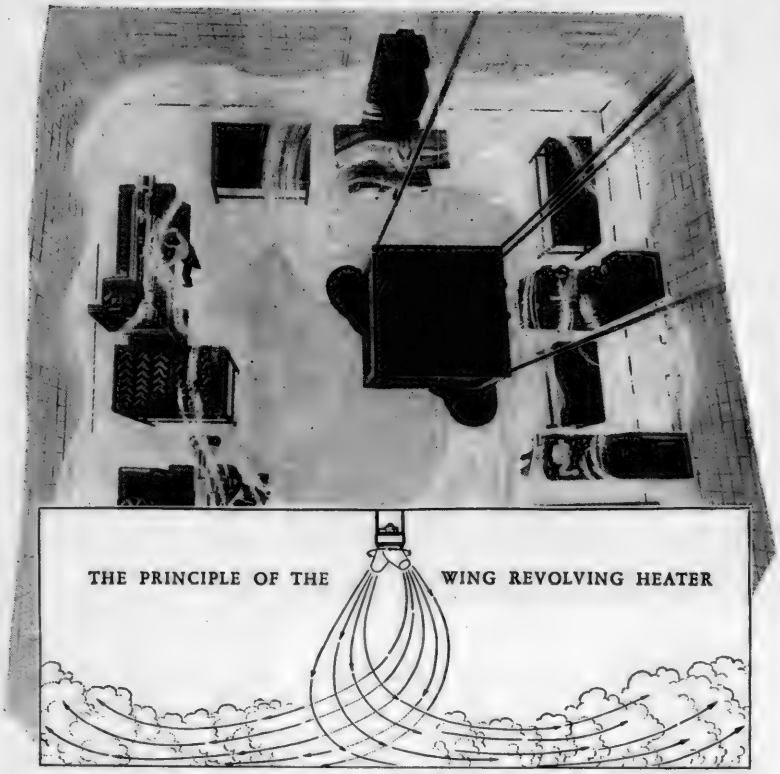


W&D I 5039

JOY

SPECIALISTS IN THE COMPRESSION AND MOVEMENT OF AIR AND GASES SINCE 1885

Summer or Winter . . . Wing Revolving Unit Heaters Bring Comfort to Your Employees . . .



The moving streams of heated air (or cooling breezes in summer) sweep slowly around through 360 degrees, covering successively every direction. The air velocity is sufficient to carry to walls, and remote corners and the constantly changing direction of flow causes the air to find its way around obstructions.

The slowly revolving outlets of the Wing Revolving Unit Heaters keep the air in constant, gentle motion, whether it be heated air in the winter or (with the steam turned off) the cooling breezes in the summer. In either case the effect on the worker is stimulating and pleasant. That is why plants equipped with Wing Revolving Heaters are satisfied *productive* plants. Why not investigate—today?

L. J. Wing Mfg. Co.

158 Vreeland Mills Road
Linden, New Jersey
Factories at Linden, N.J. & Montreal, Can.
[In Europe: Wanson, Brussels, Belgium

OUR 75TH YEAR

Wing

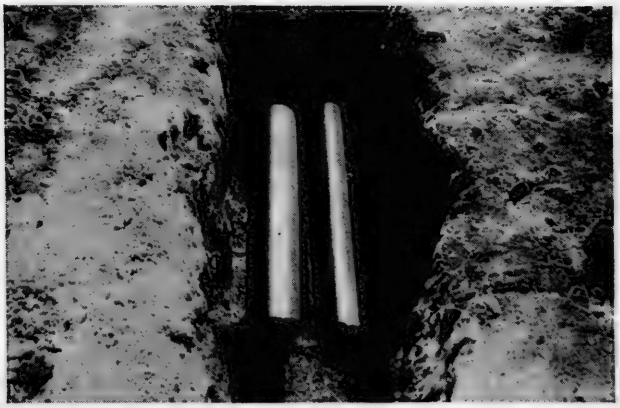
SEVENTY-FIVE YEARS AGO

Demonstrating the new Edison phonograph. This simple hand-cranked machine, invented in 1877, was soon to be in every home, doing for sound what the invention of printing had done for literature. In 1879, L. J. Wing, another talented inventor of that period, was designing and building fans, steam engines and electric motors, which won many awards for the L. J. Wing Mfg. Co., today celebrating its 75th anniversary.

3 Big Reasons Why

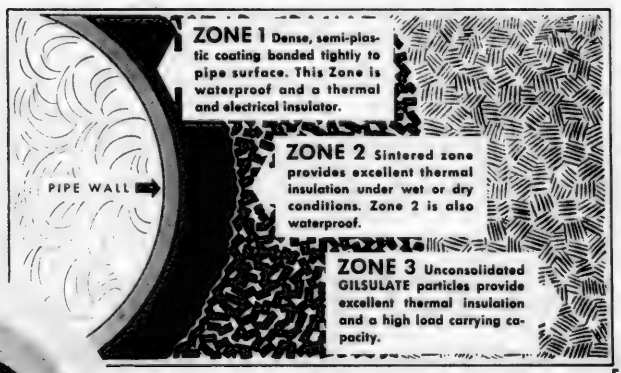
1. GILSULATE—Easy to install—Just pour it on, tamp it down and backfill. Run heat through the pipes (up to 520°F)...and the job is completed. No need to remove rocks from backfill; no problems of cramped space or multiple piping.

more and more hot underground pipe gets insulated



2. GILSULATE—Cost Less per Installed Linear Foot—No skilled labor needed...requires no mechanical sheaths, special protective devices, or costly installation procedures.

with new modern triple-zone GILSULATE®


ZONE 1 Dense, semi-plastic coating bonded tightly to pipe surface. This Zone is waterproof and a thermal and electrical insulator.
ZONE 2 Sintered zone provides excellent thermal insulation under wet or dry conditions. Zone 2 is also waterproof.
PIPE WALL
ZONE 3 Unconsolidated GILSULATE particles provide excellent thermal insulation and a high load carrying capacity.

3. GILSULATE—Delivers Permanent Triple-Zone Protection—Three tough, massive circular sheaths completely and permanently protect the pipe, cut heat loss down to 8% to 11% of bare buried pipe. Triple-zone protects against all buried line corrosion conditions: water, roots, acid, alkalis, bacteria, etc.

Fill in coupon for complete details.

GILSULATE®

THE TRIPLE-ZONE INSULATION
FOR LIFETIME PROTECTION
OF HOT UNDERGROUND PIPES

AMERICAN GILSONITE COMPANY, SALT LAKE CITY, UTAH
Affiliate of Barber Oil Corporation and Standard Oil Company of California
Distributors in principal cities of United States and Canada

American Gilsonite Company
134 West Broadway
Salt Lake City, Utah

Please send me further information on GILSULATE

NAME.....

TITLE.....

COMPANY.....

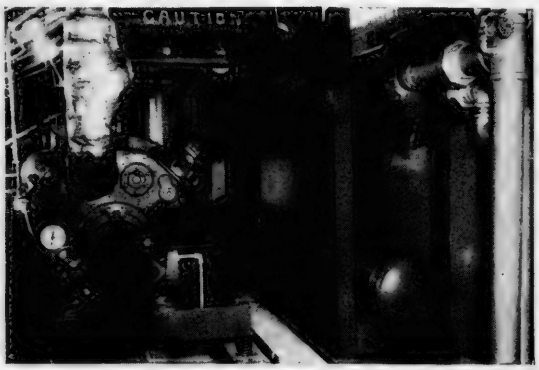
ADDRESS.....

HV

Acme products air condition modern Florida church . . .

Park Temple Methodist Church at Ft. Lauderdale, Fla. has 60-ton, direct expansion air conditioning system that uses six Acme units. System keeps interior cool even at peak load intervals when church is crowded and outside temperatures soar. Equipment was specified by G. L. Cadenhead, M. E., installed by Hill York Broward Corp.: Chas Daniels, President; Thos. Baker, Engineer.

This Acme Cooling Tower of 60 tons capacity, **completely hot dip galvanized after fabrication,** will withstand even Florida's salty East Coast air with minimum maintenance. Acme's advanced-design all-metal cooling tower assures the owner of over 95% water savings during a long trouble-free life — there's no wood to rot in an Acme Tower.



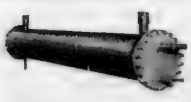
Acme units installed under roof of church include Freon Condenser, two Heat Exchangers, Liquid Receiver, and Oil Separator. Acme's 34 years of experience in air conditioning and refrigeration show up in the efficiency of this installation and thousands more. Whatever your air conditioning or refrigeration problem, it will pay you to specify Acme and be sure the job is right.

ACME INDUSTRIES, INC.

Mfgs. of a complete line of Air Conditioning and Refrigeration Equipment

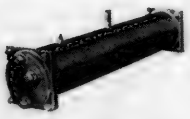
JACKSON, MICHIGAN

Evaporative Condensers
Cooling Towers
Floor-type Unit Coolers



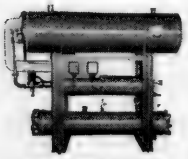
Direct Expansion (Dry-Ex) and Flooded Liquid Chillers

Heat Exchangers, Oil Separators

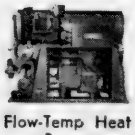


Shell and Tube, Shell and Coil Condensers

Receivers, Pipe Coils

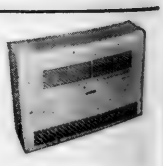


Packaged Liquid Chillers to 225 tons



Flow-Temp Heat Pumps

Flow-Cold Liquid Chillers



Remote Room Conditioner

Continuously serving the air conditioning and refrigeration industry since 1919

Our only product is tubing. Every phase of Reading's huge, streamlined production and distribution system is specialized to bring you the finest tubing in the most efficient way. No bottlenecks in production at the factory mean no depleted stocks for the wholesale supply house—no hold-up on the job for the contractor. When you sell or use Reading copper tube, you can always count on getting tube of uniform high quality and delivery of the type and size you want when you need it!

An Example of
READING'S
***PLUS* SERVICE**

Straight lengths of Reading Type L tubing in sizes up to ¾" automatically receive extra processing for sag-resistance and easy bending. No special ordering—no extra cost! This is just one instance of the extent to which Reading goes to give you product and service second to none in the industry.

READING COPPER · BRASS TUBE

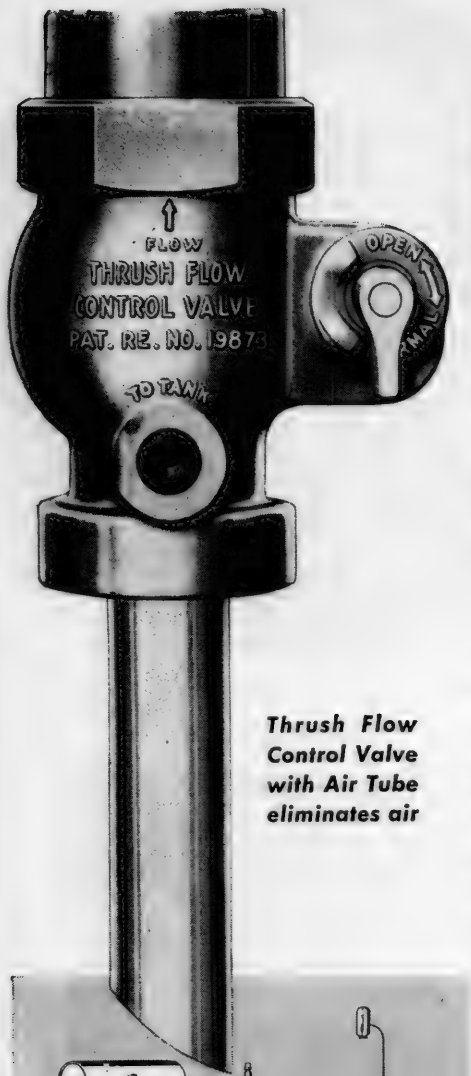
Sold Through Wholesalers Only

READING TUBE CORPORATION

EMPIRE STATE BUILDING, NEW YORK 1, N. Y. PLANT: Reading, Pa.

Distribution Depots:

- READING, PA.
- WOODSIDE, L. I., N. Y. 57-17 Northern Blvd.
- CHICAGO, ILL. 724 W. 50th St.
- HOUSTON, TEXAS, 1121 Rothwell St.
- ATLANTA, GA., 690 Murphy Ave., S.W., Unit 5, Bldg. B
- CLEVELAND, OHIO 4615 Perkins Ave.



Thrush Flow Control Valve with Air Tube eliminates air

when you

MODERNIZE

old radiator heating plants be sure to add

THRUSH

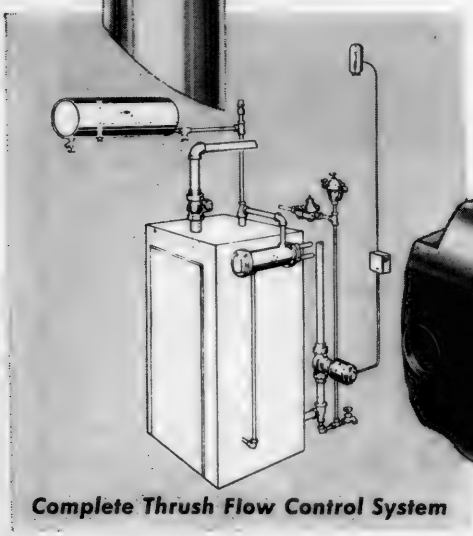
forced circulation

Steam, vapor or old hot water heating plants all can be easily converted to efficient, modern forced circulating hot water heating with low-cost Thrush equipment.

Why add automatic firing unless you go the rest of the way? Make sure your customer will enjoy really uniform, economical heating with Thrush System. It makes any job heat better with lower fuel cost. There is no noticeable variation in room temperature in any weather. Plenty of hot water for kitchen, laundry and bath is provided by the same heating boiler, winter and summer.

HOT WATER HEAT IS BEST

See your wholesaler today for more information about modernizing old heating plants with Thrush System or write Dept. D-6.



Complete Thrush Flow Control System

Thrush Water Circulator provides positive circulation

H. A. THRUSH & COMPANY

PERU, INDIANA

EFFICIENT HEAT EXCHANGE

WITH MINIMUM COOLING WATER

FOR COOLING IN A CLOSED SYSTEM

- jacket water of compressors
- lubricating oils
- quench oils
- Diesel jacket water
- jacket water of natural gas and other engines

"BUFFALO" TYPE "EWC" EVAPORATIVE WATER COOLERS

are more and more the ideal answer to efficient, economical liquid cooling as water supplies become increasingly short. In these units, the liquid to be cooled passes thru a bank of coils continuously sprayed. Fan draft causes evaporation on the large surface of the coils and dissipates the heat. The results in this closed system — exceptionally high heat transfer in a highly compact unit—close control of liquid temperatures — very small makeup water requirements. "Buffalo" "EWC" units are available in capacities for cooling from 20 to 600 gpm of liquid, and are built in 3 basic, demountable sections for moving in thru standard building openings. High-quality parts, including "Buffalo" Pumps, Fans, Non-Clogging Spray Nozzles, Aerofin Coils, and heavy-gauge tank and paneling mean "Q" Factor* performance. Write today for Bulletin 3666A.

"Buffalo" Type "EWC" Evaporative Water Cooler with recirculating dampers for automatic temperature control.

**The "Q" Factor — The built-in Quality which provides trouble-free satisfaction and long life.*

"Buffalo"

BUFFALO FORGE COMPANY

480 BROADWAY BUFFALO, NEW YORK

Publishers of "Fan Engineering" Handbook

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities

...TING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING ...

Completely NEW Line of

Now! Wider range, exclusive new features

20 new Trane Climate Changers for any capacity, 600 to 29,000 cfm! Complete line of factory-built units for flexible application, easy installation!

Now, a brand new, more complete line of TRANE Climate Changers with an even wider range of capacities—20 new models for more flexible application.

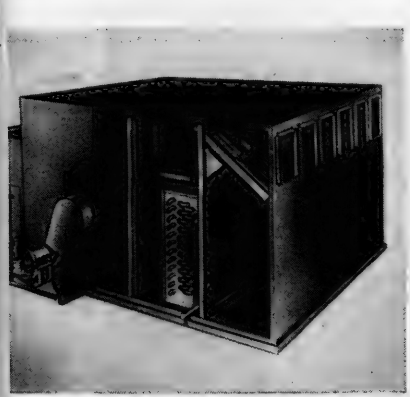
Designed for easier installation, full accessibility and less maintenance, these *new* TRANE Climate Changers are the most modern factory-built air handling units in the industry!

Wider capacity range simplifies selection. Ten sizes cover entire range of capacities from 600 to 29,000 cfm. You can select a unit with just the capacity you need for maximum system operating efficiency.

New fans are more efficient, quieter. Every fan designed especially for its unit for highest efficiency, quietest operation. Low outlet velocity—approximately 1,500 feet per minute. Climate Changers are rated by fan capacity *in the unit.*

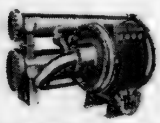
Increased design flexibility, more accessories. You get any or all of 24 *practical combinations* of heating, cooling, humidification, dehumidification, ventilating and filtering. Three types of heating coils for steam or hot water—five types of cooling coils for chilled water, well water or Freon. Three types of humidifiers, three kinds of filters. Matched face-and-by-pass dampers and mixing boxes. *No other air handling unit offers such versatility!*

Installation simplified. Fan outlets, for example, are quickly reversible on job—three ways on vertical units,



6 climates from one Climate Changer! TRANE Multi-Zone Climate Changers give individual temperature control in one to six zones. Units are quality constructed. Sectional construction if desired. 1,800 to 23,400 cfm.

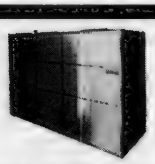
A Trane Product for Every Air Conditioning Need



CenTraVacs, Centrifugal Water Chillers 45 to 400 ton capacity.

UniTrane Room Units for air conditioning multi-room buildings.

Cold Generators, packaged water chillers, 10 to 100 tons capacity.



Self-Contained Air Conditioners from 3 to 20 tons capacity.

one source • one responsibili

TRANE

Climate Changers

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

The Trane Company, La Crosse, Wis. • East. Mfg. Div., Scranton, Penn.
Trane Co. of Canada, Ltd., Toronto • 90 U.S. and 14 Canadian Offices

Trane Climate Changers

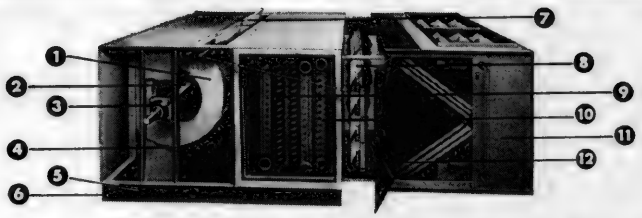
in industry's most modern air conditioner

two ways on horizontal units. Motor mount adjustable four ways. All units will clear 36″ door except sections of largest unit which will clear 40″ door.

External bearings cut maintenance time and cost. Bearings can be serviced in minutes instead of hours. All bearings are self-aligning type.

Sloping drain pan for positive drainage. Side drain connection for minimum head room. Pan under *entire* unit. From top to bottom, new TRANE Climate Changers are designed for efficiency, built for long service!

Specify TRANE Climate Changers. For complete details and roughing-in dimensions, call your TRANE Sales Office or write TRANE, La Crosse, Wis.

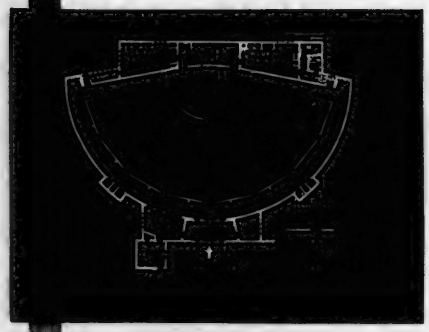


1. **Centrifugal fans** designed for unit.
2. **Fan shaft** — large diameter, solid steel.
3. **External bearings** for easier maintenance.
4. **Humidifiers** — available in three types.
5. **Sloping drain pan** — gives positive drainage.
6. **Side drain connection** — saves head room.
7. **By-pass dampers** for temperature control.
8. **Face dampers** interconnected with by-pass.
9. **Cooling coils** — water or D.E.; five types.
10. **Heating coils** — steam or hot water; three types.
11. **Mixing box** with dampers and filters.
12. **Full access** to interior of unit.

New TRANE Climate Changers with sectional construction are designed to meet close space requirements, a wide variety of capacity needs. Horizontal models (below) can be ceiling suspended or installed on platform. Vertical models are floor mounted. Fan outlets are reversible on job . . . 3 ways on vertical units, 2 ways on horizontal. Units *deliver* the capacity you select—TRANE Climate Changers are rated by fan performance *in the unit*, from 600 to 29,000 cfm.

PAUL THIRY'S *daring, functional design called for modern*

SARCOTHERM HEATING CONTROLS



Architect: **Paul Thiry**
Engineers: **The Austin Company**
Heating Contractors: **L. G. Massart Plumbing & Heating Co.**

CHURCH OF CHRIST THE KING, SEATTLE, WASH. Semi-circular arrangement seats 550 persons with no pew more than 50 feet from altar. Other features: 60-foot carillon tower; covered portico, stained glass clerestory.

TAKE ADVANTAGE OF SARCOTHERM'S UNUSUAL ENGINEERING SERVICE

In A Class By Itself—Sarcotherm's engineering service begins with the inception of the job, *carries through* every step of the way.

Complete Installation Drawings And Wiring Diagrams—not just general drawings but complete, tailor-made drawings and diagrams for each individual job.

On The Job Help—your contractor gets full cooperation and technical assistance backed by many years of specialized experience.

ARCHITECT PAUL THIRY'S inspiring design for Church of Christ The King is completely functional from its 60-foot carillon tower down to its weather modulated controls.

Radiant heating and the large attendance expected necessitated an extremely accurate, sensitive control system. To do the job, design engineers specified a Sarcotherm Weather Compensated Control System which insures comfort conditions inside regardless of outside temperatures.

Sarcotherm advantages of simple, low-cost, accurate control plus unique engineering service can help you design and install the most efficient system possible. A Sarcotherm engineer will be happy to advise you on your next project.

For full information on Sarcotherm controls, write for complete catalog.

SARCOTHERM CONTROLS, Inc.

Empire State Bldg., New York 1, N.Y.

An Affiliate of SARCO COMPANY, INC.

Weather Modulated Controls for **HOT WATER, RADIANT AND STEAM** *Heating Systems*

Meet the Tubes that Meet Your Needs

B&W Seamless and Welded Carbon, Alloy and Stainless Tubing for Condensers and Heat Exchangers

CARBON STEEL

This grade is used where service conditions are mild, that is, where the temperatures involved are relatively low and corrosive attack is not anticipated.

LOW CHROMIUM STEELS

The addition of chromium and molybdenum give these alloys good strength at elevated temperatures and improved resistance to oxidation as well as resistance to deterioration in services involving some hot corrosive gases.

INTERMEDIATE CHROMIUM STEELS

These grades have applications similar to those of the low chromium group except the additional alloying elements improve their characteristics and permit higher operating temperatures. They are particularly adapted to the handling of oils or hydrocarbon fluids containing sulphur compounds.

NICKEL STEELS

These steels are particularly suited for handling neutral salt solutions such as sodium and potassium nitrate or sulphate. They have found service in the black liquor evaporators of soda and kraft paper mills. Another field of application has been in sub-zero temperature service where high impact resistance is also a necessity.

STAINLESS STEELS

These steels are for specialized application where service conditions are extreme, that is, where corrosive environments or high temperatures are problems. The stainless steels have wide usage in the chemical industries, petroleum refinery, paper making, drug preparation, food processing and dairy and beverage industries.

For sound assistance in meeting your specific tubing requirements, write for Bulletin TB-329A or, better yet, get in touch with Mr. Tubes, your link to B&W. He represents B&W's headquarters technical staff and strategically located district offices, and B&W's nationwide network of fine tubing distributors.

B&W SEAMLESS and WELDED TUBES

THE BABCOCK & WILCOX COMPANY
TUBULAR PRODUCTS DIVISION
Beaver Falls, Pa.—Seamless Tubing; Welded Stainless Steel Tubing
Alliance, Ohio—Welded Carbon Steel Tubing

TA-4044(CWP)

1854 · 1954

our 100TH year

OF SUCCESSFUL MANUFACTURING EXPERIENCE

YOU'LL SELL MORE PROFITABLE JOBS

with the complete line of

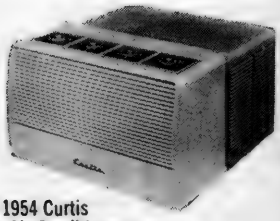
Curtis

AIR CONDITIONING AND REFRIGERATION EQUIPMENT

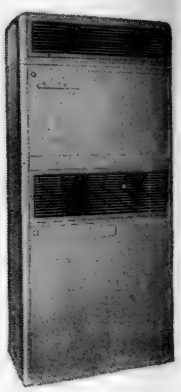
Every product in the Curtis line is built with quality material and workmanship.

Curtis equipment is known around the world for its dependability and efficiency.

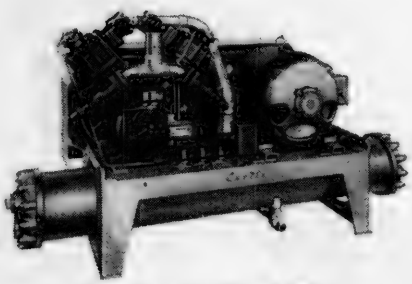
With the complete Curtis line, you can handle any installation for **Home, Office, Store,** or **Factory.**



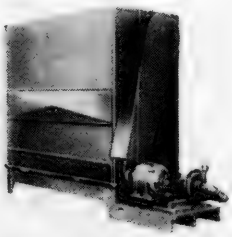
NEW 1954 Curtis Room Air Conditioner—an attractive, efficient unit with a BIG market potential



Packaged Units—2, 3, 5, 7½ and 10 tons Choice of open or semi-hermetic compressors... and 15 ton packaged Central type units



Condensing units—through 80 tons



Evaporative Condensers, Cooling Towers and Air Handling units to match

Residential cooling and heating units

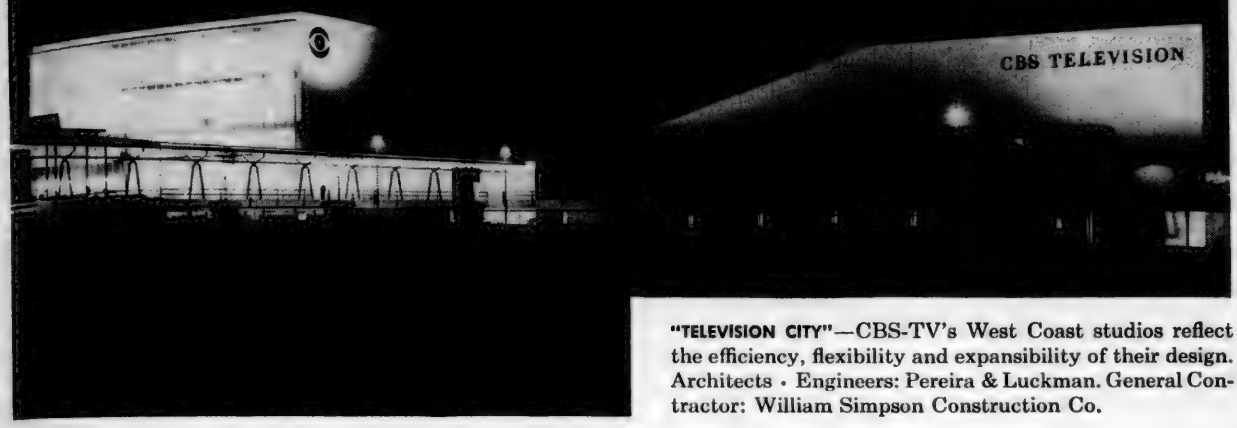
You may qualify for a direct factory franchise. Write us, using your company letterhead.

National advertising in *Saturday Evening Post, Time, Newsweek* and *House and Home*, plus many other publications helps sell Curtis to your customers and prospects. Attractive new sales literature is available to help you sell in your local area.

765

CURTIS REFRIGERATING MACHINE DIVISION
OF CURTIS MANUFACTURING CO.
1999 KIENLEN AVENUE
ST. LOUIS 20, MISSOURI

TELEVISION CITY ... expansible nucleus for a giant of the future



"TELEVISION CITY"—CBS-TV's West Coast studios reflect the efficiency, flexibility and expansibility of their design. Architects · Engineers: Pereira & Luckman. General Contractor: William Simpson Construction Co.

● The Columbia Broadcasting System's clean-lined "Television City" in Hollywood, California is the core of an anticipated 25-acre, 24-studio expansion of the network's West Coast TV production facilities. Plans for future enlargement of the building specify that the present walls be easily demountable. Consequently, most of the exterior is composed of large, plain, movable steel panels and glass walls.

The sleek lines of the structure manifest the ideas of efficiency and flexibility upon which the design was based. With such key words as a guide to design, it is a foregone conclusion that the most efficient and dependable pipe and tubing should be chosen for the building's plumbing and heating systems. NATIONAL Steel Pipe got the nod.

For over 60 years NATIONAL has been the accepted standard pipe for conventional hot water and steam heating systems, fire control, and plumbing lines. And today, it is the first choice, too, for modern radiant heating and snow melting installations. Regardless of the application, architects know from long experience that they can put their complete confidence in the uniform, dependable performance of NATIONAL Pipe.

Take a tip from the old timers. When you plan your next installation, plan on using the best-known pipe in the world—U·S·S NATIONAL Steel Pipe.

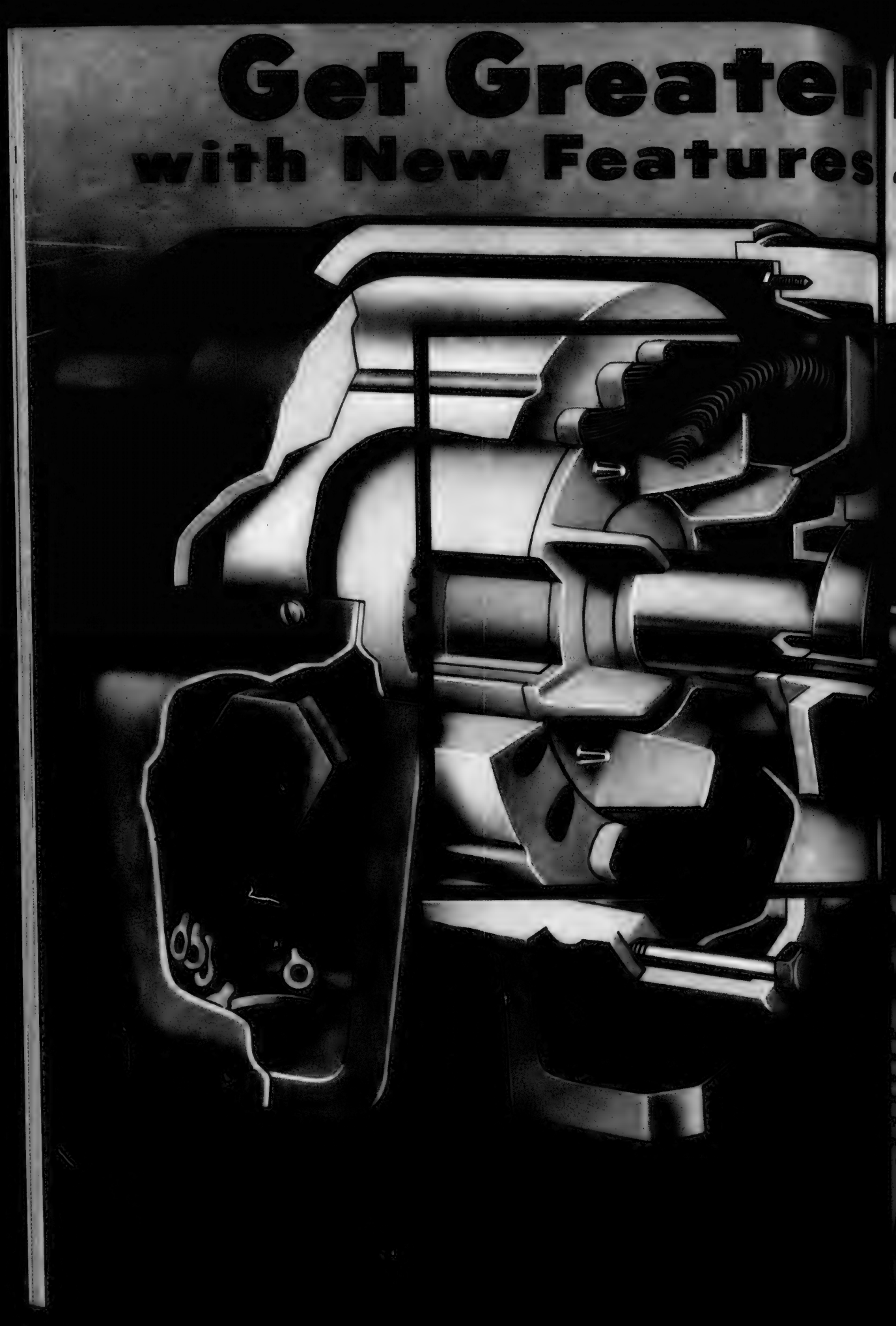
NATIONAL TUBE DIVISION,
UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

U·S·S NATIONAL Steel PIPE

UNITED STATES STEEL

Get Greater
with New Features

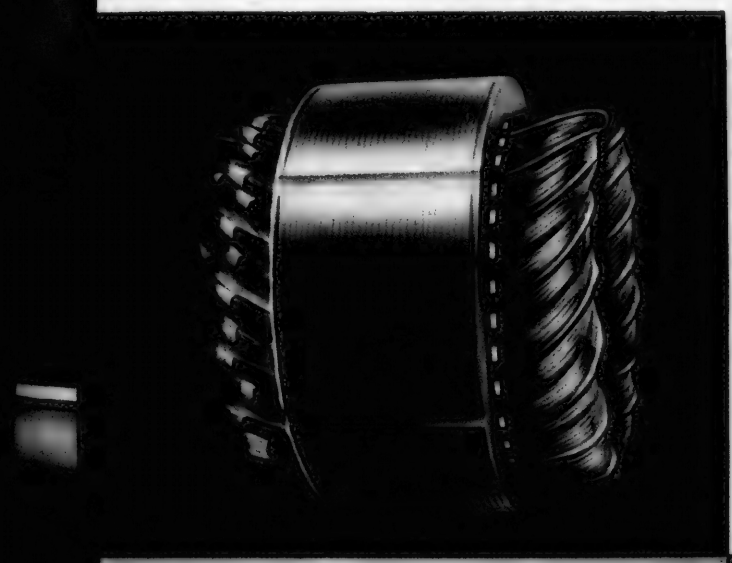


Motor Economy
. . . Proved Principles

Here's the inside story of a great new motor. It combines the best of the new developments in methods and materials with the best of the tried and proved principles that have made such an outstanding record for Allis-Chalmers motors.

Smaller in size than previous designs, it offers greater protection against damage from falling liquids and solids. The bearing design gives greater bearing protection, ease of maintenance and long life. Insulation gives you famous Allis-Chalmers rugged dependability.

Consult your nearby Allis-Chalmers Authorized Distributor or District Office on your motor needs. Or write for Bulletin 51B6210.



STATOR DOUBLE INSULATED—Stator laminations are welded across back for rigidity. Heavy varnished cambric insulation is inserted between phase windings. Wound stator is dipped several times in special insulating varnish of proved effectiveness and stamina, and baked after each dip. The Allis-Chalmers stator is both physically and electrically strong . . . thoroughly protected against moisture, heat and corrosion.

RIGID CAST-IRON FRAME—Heavy, distortion-free cast-iron frame holds bearings in rigid alignment . . . gives all-around protection against physical damage . . . resists rusting.

Air intakes are well protected by being located on the underside of the end housing. There is plenty of room for free air circulation on the back of the stator core for efficient, even cooling. Air is discharged horizontally and to the sides.

ultiple bearing protection keeps grease in . . .
eeps dirt out . . . permits relubrication in service

xtreme care has been taken to provide longest possible aring life and lowest possible maintenance costs. The aring itself is of double-shielded type, which allows conolled migration of grease in and out of the bearing to suit perating conditions. Yet bearing is protected against reatest cause of bearing trouble — overgreasing.

Close running clearances and double labyrinth seals between the shaft and outer bearing housings keep grease in the bearing and exclude dirt. Grease is kept out of the interior of the motor by a bearing cap with a long running clearance along the shaft. The cap is held tightly in place by hex head cap screws. Large grease chambers hold an ample supply of lubricant.

A-4362

ALLIS-CHALMERS

MILWAUKEE 1, WISCONSIN

IT'S THE TALK OF THE TRADE!

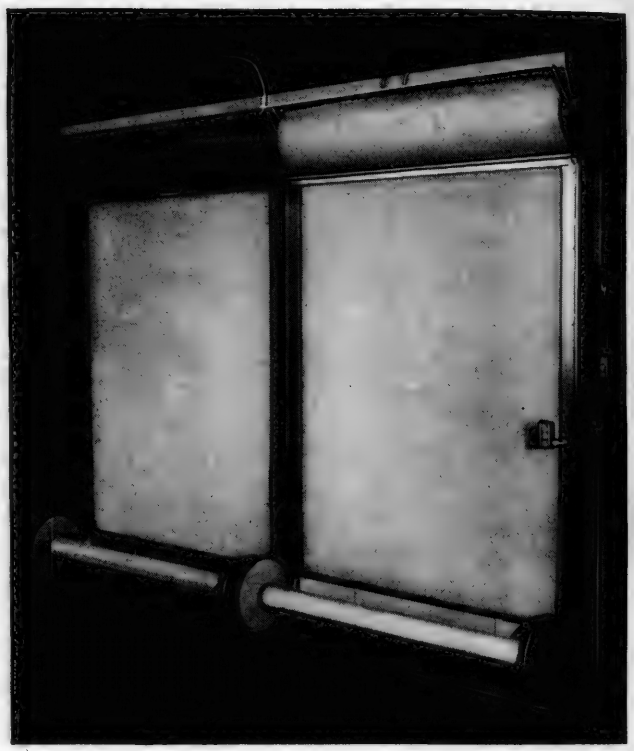
Roll-O-MATIC

The air filter that renews its media automatically for continuous high efficiency and "rock-bottom" maintenance costs

Here's the most self-sufficient air filter ever designed. It's the new ROLL-O-MATIC—an automatic, renewable media air filter that checks and maintains its efficiency for weeks and months without that first visit from the maintenance crew.

ROLL-O-MATIC is a viscous filter utilizing a low cost filtering media consisting of a 2" thick mat of glass fibre material sprayed with a nonflammable fluid-jell adhesive. The media, mounted at top of filter in roll form, moves as a continuous curtain down the face of the ROLL-O-MATIC and is rerolled on motor-driven spool at bottom. A pressure differential switch or a synchronous timer regulates movement of the filter curtain so that media usage is in direct proportion to the dust content of the air.

What is the life expectancy of the ROLL-O-MATIC media? Under normal operating conditions, one roll should last one year per 10,000 cfm of capacity. But you can't lose—regardless of amount used, your media cost will still be less than that of throw-away filters.



A ROLL-O-MATIC Filter of two 5'0" wide by 8'0" high sections—capacity 26,700 cfm.

Simplicity of ROLL-O-MATIC's design and operation offers other dividends, too, in the form of lighter weight, low installation cost and elimination of all water and drain connections. Call your local AAF representative for complete information, now, or write direct for Bulletin No. 248.

AAF

American Air Filter

COMPANY, INC.

American Air Filter of Canada, Ltd., Montreal, P. Q. • 294 Central Avenue, Louisville 8, Kentucky

Remember the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS.

tt
TUBE-TURN

the complete line FOR ALL YOUR NEEDS

YOU CAN specify TUBE-TURN Welding Fittings and Flanges and know that you will get the *exact* answer to your specific piping problem. This leading line includes more than 4,000 items, in all piping materials . . . carbon steels, non-ferrous metals and alloys . . . schedules and sizes to match *your* design.

Carbon steel elbows, for example, are available from ½" to 42" diameter. Your nearby Tube Turns' Distributor provides this *complete* line promptly and backs it up with the thorough Engineering Service and how-to-do-it information of Tube Turns.

The Leading Manufacturer of Welding Fittings and Flanges

TUBE TURNS LOUISVILLE 1, KENTUCKY

A Division of National Cylinder Gas Company

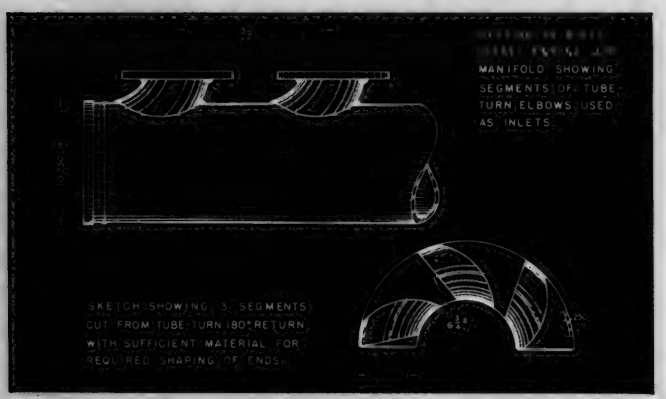
DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Cleveland • Toledo • Chicago • Denver • Los Angeles
San Francisco • Seattle • Atlanta • Tulsa • Houston • Dallas • Midland, Texas

Here's *Service* to help you solve your piping problems

TUBE TURNS' Engineering Service Division makes available a vast fund of experience for the solving of design and operating problems in piping. For example:

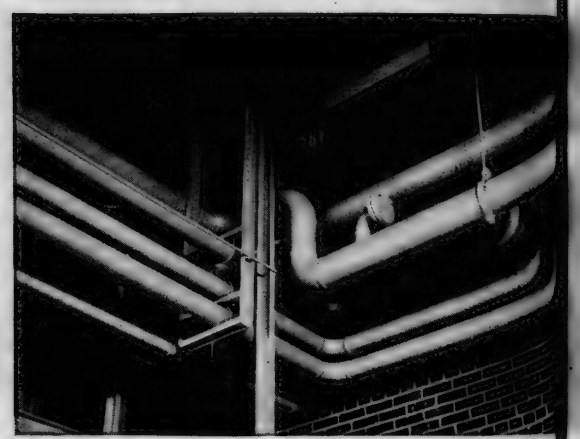
An engine builder was fabricating manifolds from formed plate. Poor fitup was a problem and costs were excessive. Tube Turns' engineers suggested using TUBE-TURN Welding Returns, cut with templates as shown in the sketch. Costs came down. The dimensional uniformity of TUBE-TURN Welding Returns and Elbows simplifies fabrication jobs such as this because they can be cut to odd angles and adapted to special requirements.

TUBE TURNS IS AT YOUR SERVICE!


MANIFOLD SHOWING SEGMENTS OF TUBE-TURN ELBOWS USED AS INLETS
SKETCH SHOWING 3 SEGMENTS CUT FROM TUBE-TURN 180° RETURN WITH SUFFICIENT MATERIAL FOR REQUIRED SHAPING OF ENDS

Header connection design problem solved by Tube Turns' Engineering Service.

YOUR NEEDS in welding fittings and flanges are met promptly by your Tube Turns' Distributor. This one reliable source can fill *all* your requirements from the world's most complete line of welding fittings and flanges comprising more than 4,000 items.



MANY USES. Piping in this modern edible oil plant conveys natural gas, hydrogen, oil, steam, cooling water, refrigerants, air and vegetable oil. All critical lines are welded and TUBE-TURN Welding Fittings are used for directional changes. Pipe sizes vary from 2" to 16".

TUBE TURNS, Dept. B-3
224 East Broadway, Louisville 1, Kentucky

Please send me free copy of Pipe and Fittings Materials.

Company Name _____

Company Address _____

City _____ *Zone* ____ *State* _____

Your Name _____

Position _____

DISTRICT OFFICES

New York	San Francisco
Philadelphia	Seattle
Cleveland	Atlanta
Chicago	Tulsa
Denver	Houston
Los Angeles	Dallas
	Midland, Texas

"tt" and "TUBE-TURN" Reg. U. S. Pat. Off.

TUBE TURNS

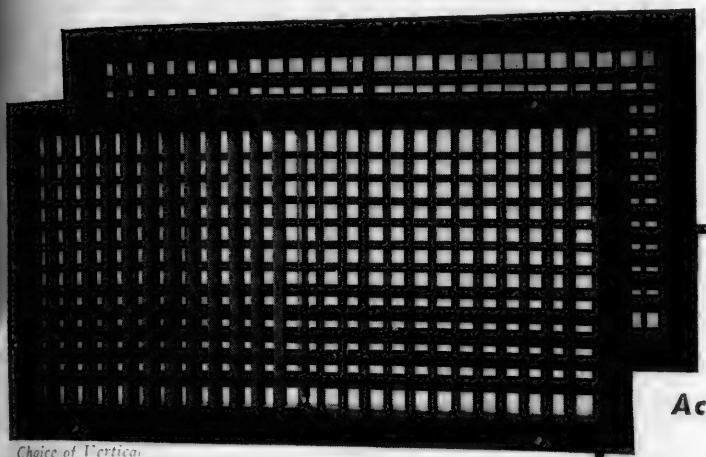
LOUISVILLE 1, KENTUCKY

A DIVISION OF NATIONAL CYLINDER GAS COMPANY

Announcing a New Heating and Air Conditioning

GRILLE WITH DETACHABLE VOLUME CONTROL

Increased Directional Control • Eliminates Possibility of Tampering or Accidental Changes • Meters Air-flow Accurately



Choice of Vertical or Horizontal front vanes

This new grille embodies features never before available to architects and contractors. It offers increased directional control and tamper-proof regulating, plus unmatched beauty, rugged strength and extreme ease of installation.

The streamlined vanes of extruded aluminum are individually adjustable. Their unique shape has been carefully engineered to divert air and provide greater directional control, and at the same time reduce air resistance to a minimum. This means more delicate and accurate balancing is possible.

Each vane is individually controlled by the use of a special tool, and operates under spring-loaded tension. This practically eliminates any possibility that the deflection pattern can be altered as a result of either an accident or by tampering.

The fully-enclosed, wrap-around frame makes the grille sturdier, more attractive and assures easier, safer installation. Since the entire mechanism is concealed, the possibility of "air leaks" is eliminated.

Series "400" A-J Grilles (with—or without volume control) are available in any size, with a choice of vertical or horizontal louvers only—or a combination of both, with either louver in front. Both sets of louvers are fully adjustable without removing grille. Grilles may be ordered in prime coat, hammered bronze or metallic gray or any standard finish.

MATCHING RETURN AIR GRILLES AVAILABLE

For More Information—Call or Write

A-J MANUFACTURING CO.
Washington St. Dept. V6 Kansas City 8, Mo.

A-J

AT LAST!

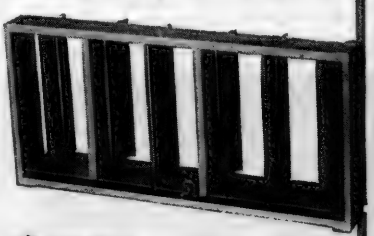
A PERFECTED VOLUME CONTROL

Detachable — Easy to Operate

Accurately Meters Air-flow from a "Whisper" to a "Full Blast"!

Here's a volume control you can depend on! It meters the flow of air accurately at every stage—from fully closed to fully open. There are no "dead spots." The louvers move simultaneously in opposing directions. The gear-driven action assures smooth, easy, uniform operation; and the system may be completely balanced without removing the outer grille.

The volume control is an integral unit, which is available with the A-J Grille #400, or can be quickly installed at any later time in just a few minutes with only a screw driver!



Vanes fully open for maximum air flow

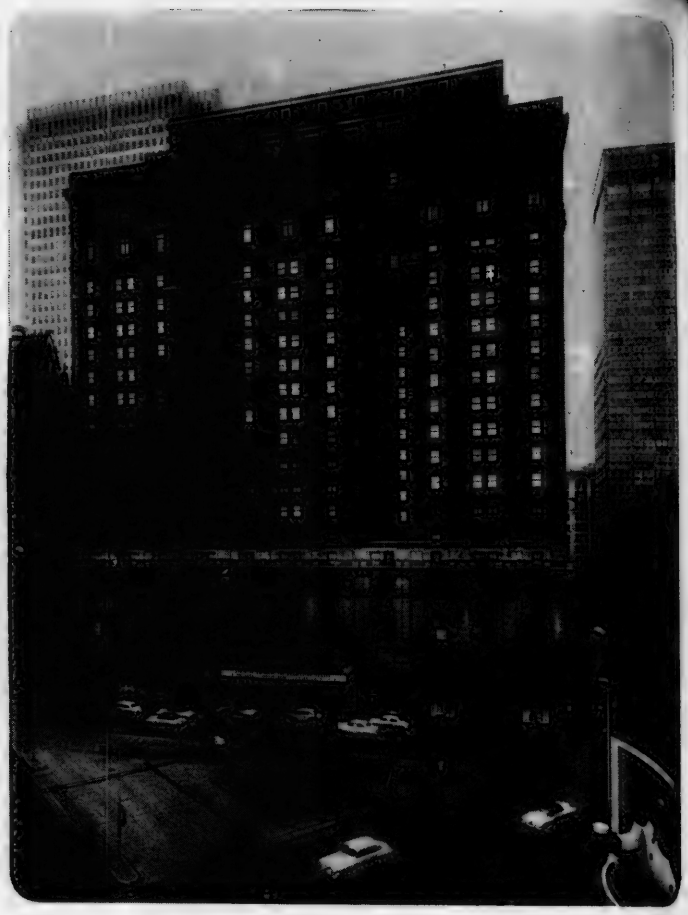
Vanes partially closed to accurately meter desired air flow

Vanes tightly closed for positive shut-off

Hotel William Penn, Pittsburgh, is Served Five Ways by —

TRADE FRICK MARK®

Refrigeration



These include air conditioning, cooling drinking water, refrigeration of foods, freezer service, and making ice. This magnificent hotel has used Frick equipment since 1936, and finds it both efficient and dependable. Three of the four Frick compressors are shown below.

The buildings in which you are interested can likewise profit by using Frick Equipment. We make air conditioning units and central systems; compressors handling Freon-12, ammonia, and other refrigerants; condensers, coolers, coils; freezers, ice makers, ice reserve units; piping, valves, fittings, controls, and special equipment.

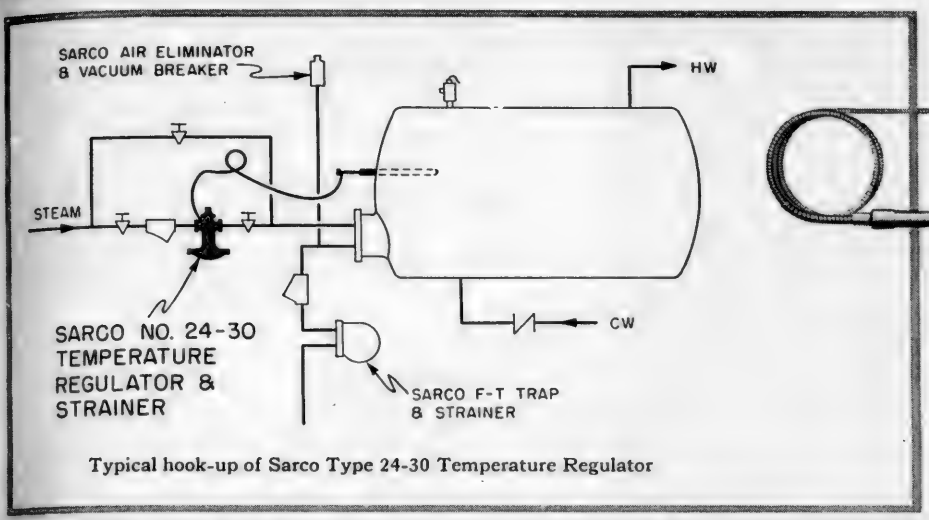
Good territories still available for dealers.

Write, wire, or phone.

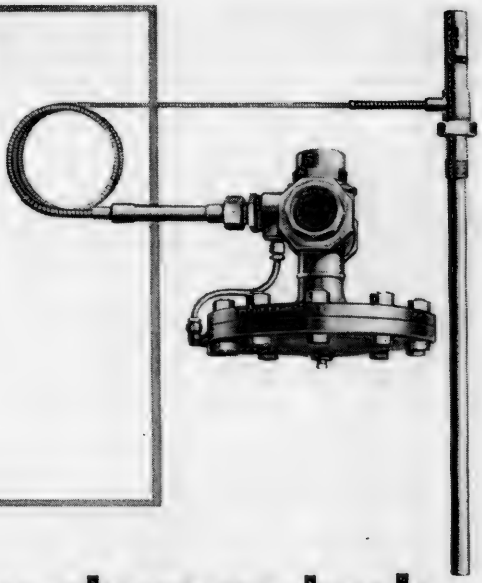
DEPENDABLE REFRIGERATION SINCE 1882

FRICK CO.

WAYNESBORO, PENNA. U.S.A.



Typical hook-up of Sarco Type 24-30 Temperature Regulator



HOT WATER...in your storage tank

...when you want it...*and at minimum cost!*

That's the performance you get when this Sarco Temperature Regulator stands guard on your water heater.

With fuel representing about 50% of your total direct power costs, it's important that you *get hot water at lowest cost per wash.*

Here's how the Sarco 24-30 Temperature Regulator does the job:

NO OVERHEATING – during periods of no draw-off. The single seated valve shuts tight, prevents creeping of temperature.

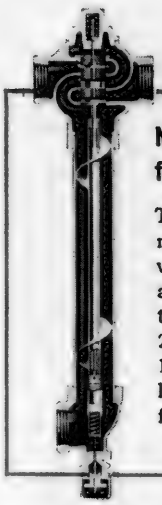
LOW INSTALLATION COST – the T R 24-30 is self-contained and self-operated, no need to install compressed air or electric lines.

CLOSE TEMPERATURE CONTROL – thermostat actuates internal pilot valve which immediately opens or closes main valve.

LOW-MAINTENANCE PACKLESS SEALS – trouble-free design eliminates stuffing boxes, no repacking, no sticking or leakage of exposed valve stems.

WIDE RANGE OF ADJUSTMENT—you can adjust this temperature regulator 25° higher or lower than the temperature setting.

So, if you're not satisfied with your hot water service, call your local Sarco representative or write for Bulletin 600. Sarco Company, Inc., Empire State Bldg., New York 1, N. Y.



Need Tempered Water for Special Washes?

This Sarco Water Blender automatically mixes hot and cold water, delivers blended water at any desired temperature. Factory set for any temperature to 200° F., is easily adjusted to 15° F. lower and up to 40° F. higher than factory setting. Ask for Bulletin 800.

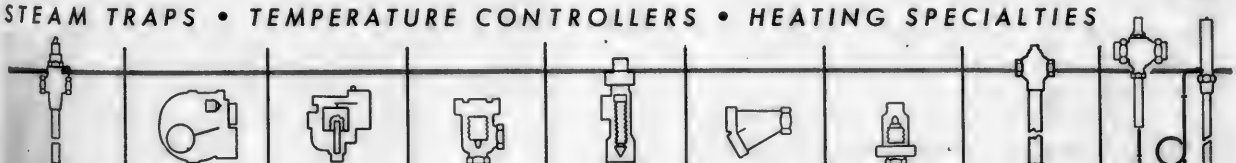
SARCO

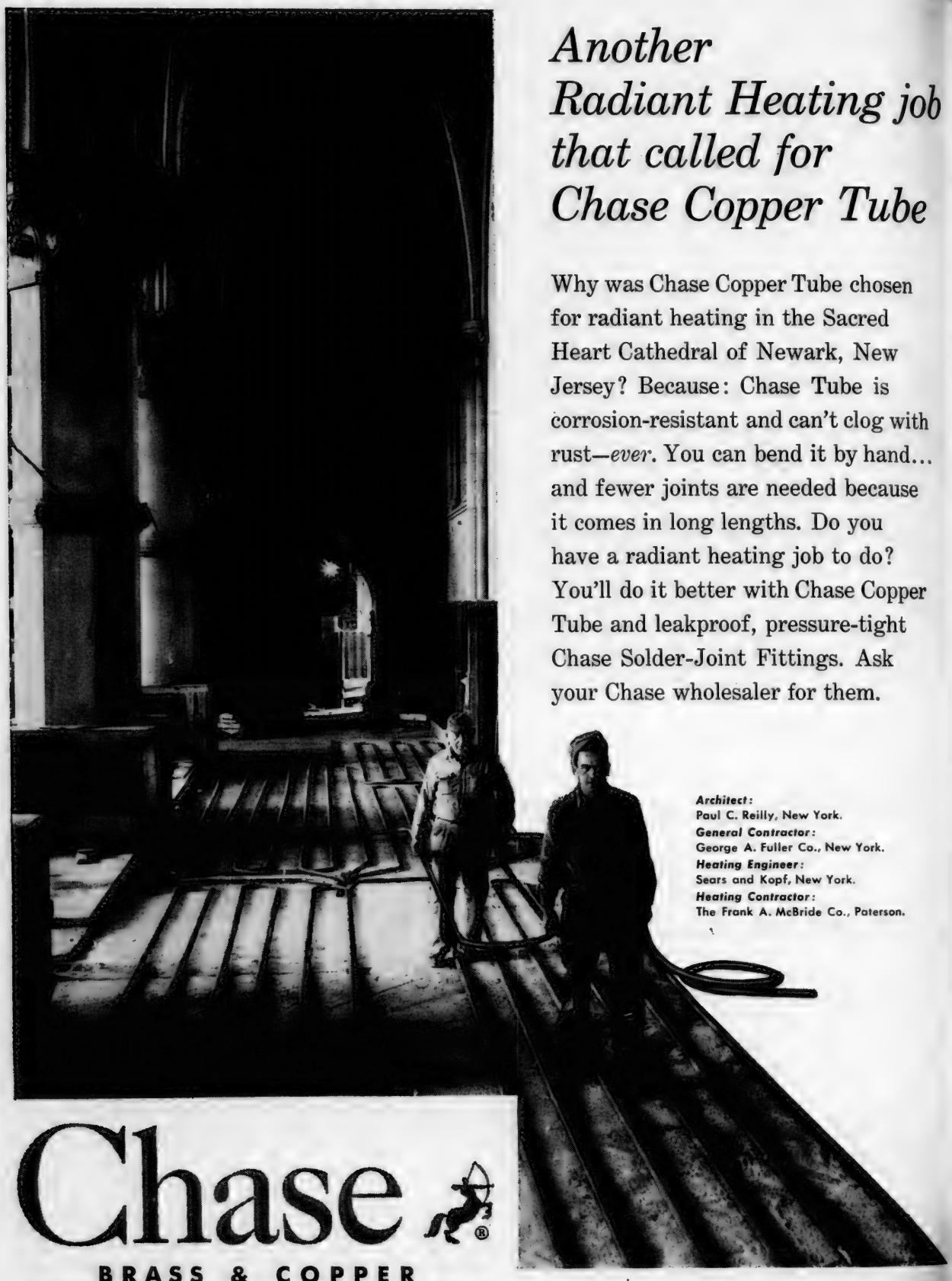
SAVES STEAM

improves product quality and output

2046-C

STEAM TRAPS • TEMPERATURE CONTROLLERS • HEATING SPECIALTIES





Another Radiant Heating job that called for Chase Copper Tube

Why was Chase Copper Tube chosen for radiant heating in the Sacred Heart Cathedral of Newark, New Jersey? Because: Chase Tube is corrosion-resistant and can't clog with rust—*ever*. You can bend it by hand... and fewer joints are needed because it comes in long lengths. Do you have a radiant heating job to do? You'll do it better with Chase Copper Tube and leakproof, pressure-tight Chase Solder-Joint Fittings. Ask your Chase wholesaler for them.

Architect:
Paul C. Reilly, New York.
General Contractor:
George A. Fuller Co., New York.
Heating Engineer:
Sears and Kopf, New York.
Heating Contractor:
The Frank A. McBride Co., Paterson.

Chase ®

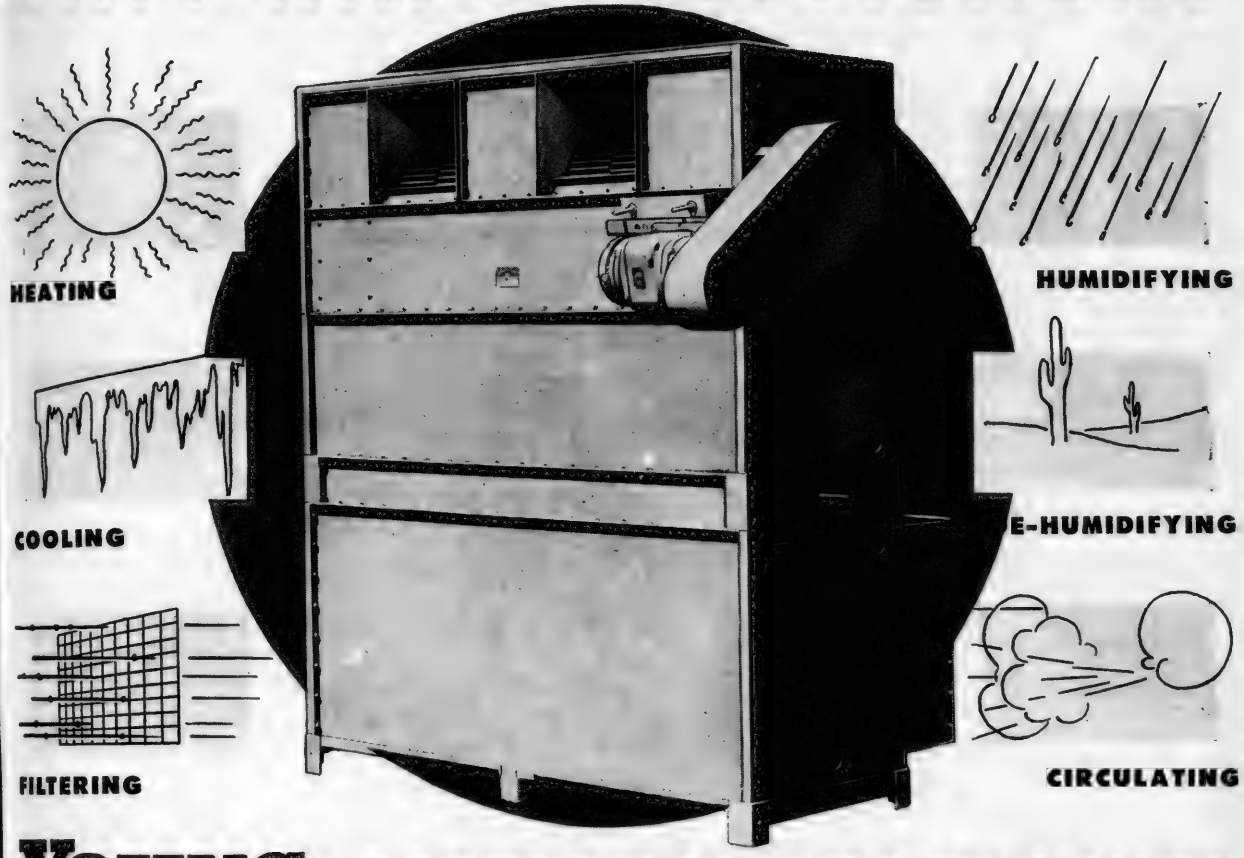
BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

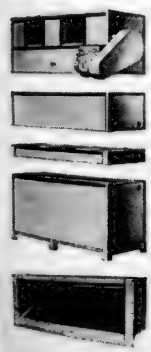
The Nation's Headquarters for Brass & Copper

Albany†	Chicago	Denver†	Kansas City, Mo.	Newark	Pittsburgh	San Francisco
Atlanta	Cincinnati	Detroit	Los Angeles	New Orleans	Providence	Seattle†
Baltimore	Cleveland	Houston	Milwaukee	New York	Rochester†	Waterbury
Boston	Dallas	Indianapolis	Minneapolis	Philadelphia	St. Louis	(†sales office only)

here's COMPLETE flexibility in UNIT AIR CONDITIONERS



YOUNG SECTIONAL "YAC" UNITS



FAN SECTION—Dynamically balanced multi-blade fan(s). Air discharge direction alterable.

HEATING COIL SECTION—With non-ferrous tube and fin coils available for hot water and steam.

DAMPER SECTION—Furnished with face or face and bypass dampers as required.

BASE & COOLING COIL SECTION—With serpentine or cleanable type water, or direct expansion coils.

FILTER SECTION—Incorporating either throw away or cleanable type filters.

MEET EVERY AIR CONDITIONING REQUIREMENT

Young sectional design air conditioning units enable you to offer year-around comfort. To meet specific requirements, "YAC" units are available in any combination from simple heating or cooling to complete air conditioning, including heating, humidifying, cooling, dehumidifying, filtering and circulating. "YAC" units are built in eight compact sizes, in either horizontal or vertical types, in capacities from 400 to 15,748 cfm. They can be installed either right or left hand. Young sectional design also permits greater ease in handling, installing and servicing. For further details or Catalog, see your nearest Young sales representative listed in the "yellow pages" of your telephone, or write direct.

...AN "OLD" NAME IN HEAT TRANSFER ENGINEERING

YOUNG RADIATOR COMPANY

Dept. 524-F • Racine, Wisconsin • Factories at Racine, Wisconsin and Mattoon, Illinois

Sales and Engineering Offices in All Principal Cities

Introducing the NEW... Barkow

"O" CEILING MODEL AIR CONDITIONER

. . . for residential and commercial use . . . ideal for attic installation — Attach it to existing Warm-Air Ductwork or use as self-contained unit for Free Discharge.

It's up off the floor . . . completely out of the way . . . can be placed in the most advantageous spot and still not interfere with home or store traffic; does not occupy expensive floor space.

Yes sir, the new Barkow model "O" opens a tremendous market of residential, commerical and industrial users . . . people who heretofore found it impractical to consider air conditioning due to a lack of space. Now they and you can benefit from this space-saving, economical unit. Available in two and three ton sizes with or without blower.

Check These BARKOW Features:

- ✓ HERMETICALLY SEALED COMPRESSOR
- ✓ INEXPENSIVE THROW-AWAY FILTERS
- ✓ COMPLETE PACKAGED UNIT
- ✓ EASY TO INSTALL—EASY TO SERVICE
- ✓ ALL PARTS ACCESSIBLE FROM FRONT PANEL
- ✓ USES FREON 22 REFRIGERANT
- ✓ EXCEEDS RATED CAPACITY

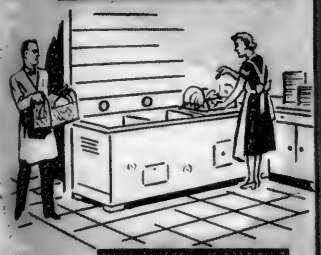
DISTRIBUTORS, ***Wire or write for details***

refrigeration division

Aug. G. Barkow Mfg. Co., Inc.

2230 South 43rd Street — Milwaukee 15, Wisconsin

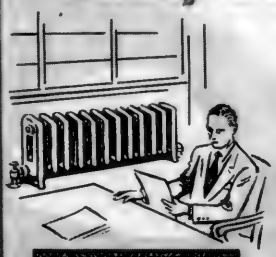
SWIMMING POOLS



DISHWASHERS

SHOWERS

Fast, Dependable Action from ADSCO WATER HEATERS



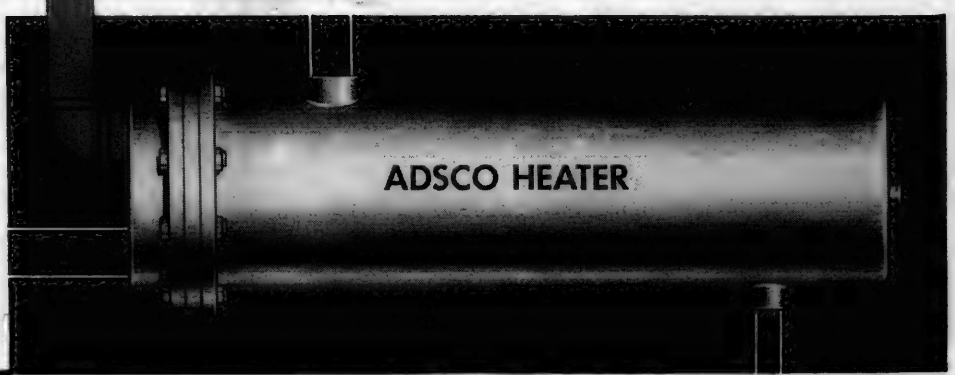
SPACE HEATING

WASH ROOMS

LAUNDRIES

Hot water! Plenty of hot water! When and where you want it... and at low cost! ADSCO Water Heaters are dependable sources of hot water in any type of plant or building wherever there is a steam supply. Use ADSCO Water Heaters for space heating, for process hot water, or for such general service as showers, laundries, dishwashers, swimming pools...even for snow melting. Write today for Bulletin 35-77 on Convertors, or Bulletin 35-78 on Instantaneous Heaters.

Where storage heaters are needed, write for ADSCO Bulletin 35-75.



AMERICAN DISTRICT STEAM COMPANY, INC.

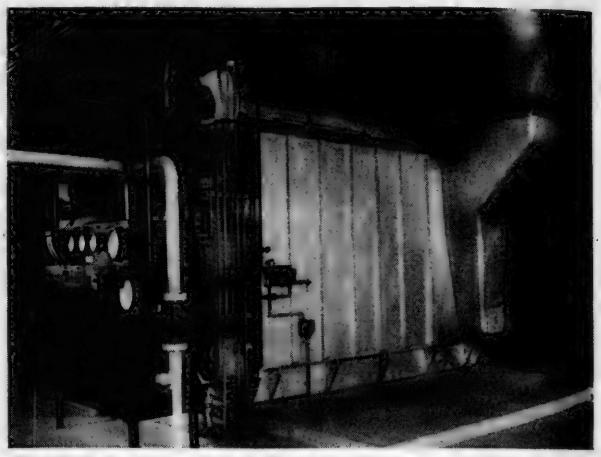
GENERAL OFFICES
NORTH TONAWANDA, NEW YORK
PLANTS: NORTH TONAWANDA, N. Y. — RICHMOND, CALIF.

FOR THE DISTRIBUTION AND UTILIZATION OF STEAM, LIQUIDS AND GASES

EXPANSION JOINTS | SEPARATORS | METERS | STEAM TRAPS | STORAGE HEATERS | STRAINERS

Why are they Buying VP Boilers?

Industrial installation in the Midwest. Two VP Boilers. Capacity—28,000 lb steam per hr each at 225 psi.



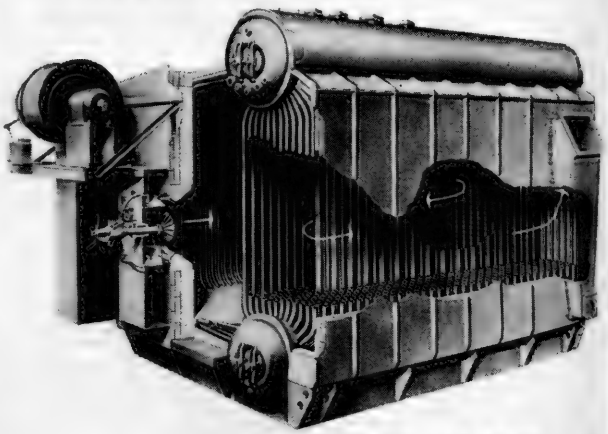
This VP Boiler serves a sewer pipe manufacturer in California. Capacity—20,000 lb steam per hr at 215 psi.

There's good reason for the fact that so many buyers of package boilers are finding that the VP offers them more for their money. For only in the VP will you find such significant *extra* features as —more water-cooling area per unit of furnace volume than any other boiler of its class . . . simple arrangement of baffles for maximum heat transfer . . . large lower drum for good accessibility and easy handling of load swings . . . quiet centrifugal fan, with less than half the noise level of typical high-speed blowers used on most other package boilers.

Little wonder then that VP purchasers range from small companies to some of the largest in the country . . . industrials of all kinds . . . schools and institutions . . . various government agencies . . . even the Atomic Energy Commission. These users are employing VP Boilers for all types of applications—heating, process, and even power generation.

Make sure then that you have details of the VP at your fingertips when next you are in the market for a boiler of moderate capacity. Ask for the new Catalog VP- 204, which contains specifications and general information on dimensions, space requirements, construction details and controls.

B-748B



Specifications—VP Boiler

Capacity—4000 to 30,000 pounds of steam per hour
Pressures—Up to 500 pounds per square inch
Fuel—Oil or gas
Erection—Completely shop-assembled
Foundation—Simple concrete slab

COMBUSTION ENGINEERING

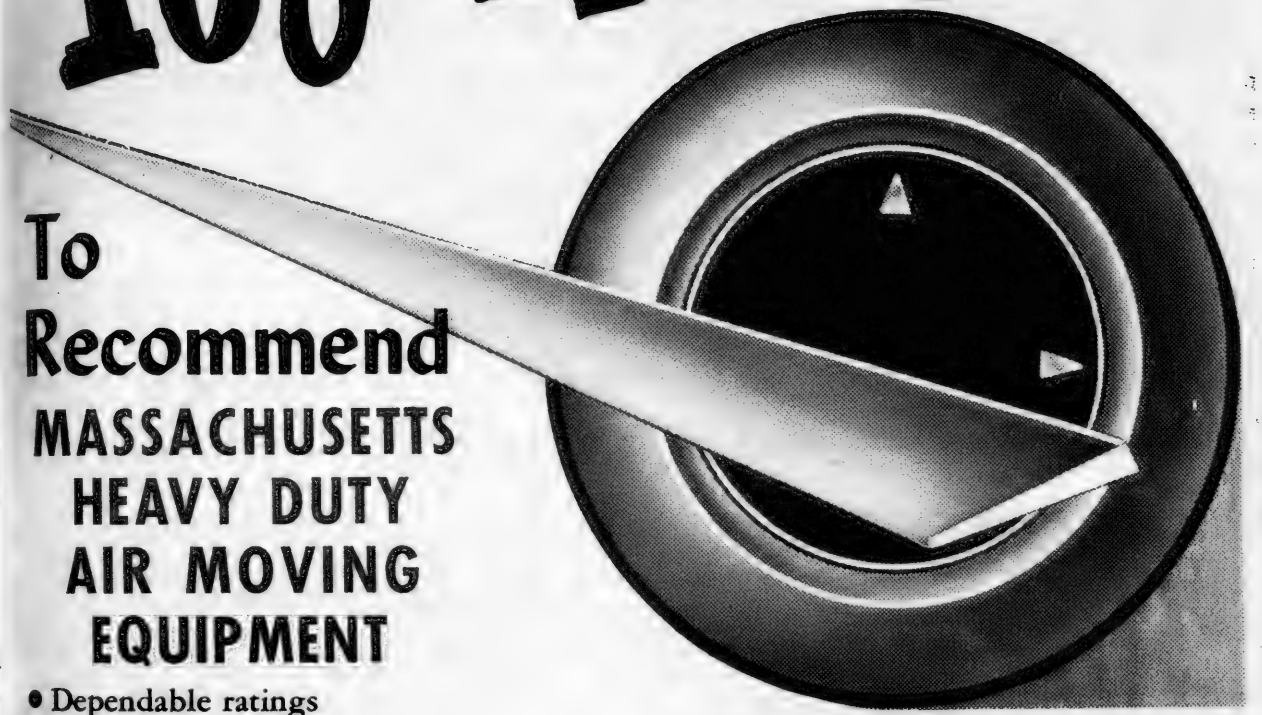
Combustion Engineering Building, 200 Madison Avenue, New York 16, N. Y.

BOILERS, FUEL BURNING & RELATED EQUIPMENT; PULVERIZERS, AIR SEPARATORS & FLASH DRYING SYSTEMS; PRESSURE VESSELS; AUTOMATIC WATER HEATERS; SOIL PIPE

The MASSACHUSETTS Line®

Our 75th Year

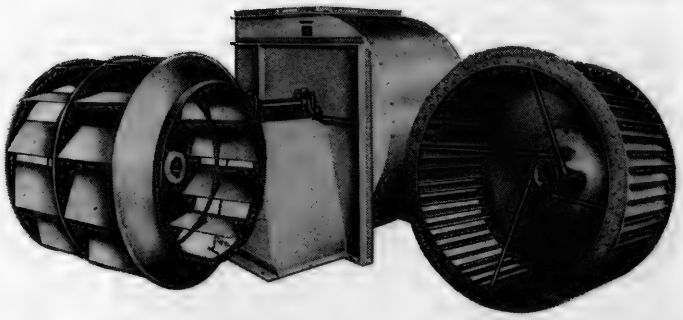
It's Time...



To Recommend MASSACHUSETTS HEAVY DUTY AIR MOVING EQUIPMENT

- Dependable ratings
- Certified by N A F M
- AUTOMATIC Inlet Vanes
- Bulletin No. 101 Squirrel Cage (Forward Curve Blade)
- Bulletin No. 105 Power Fixed (Backward Curve Blade)

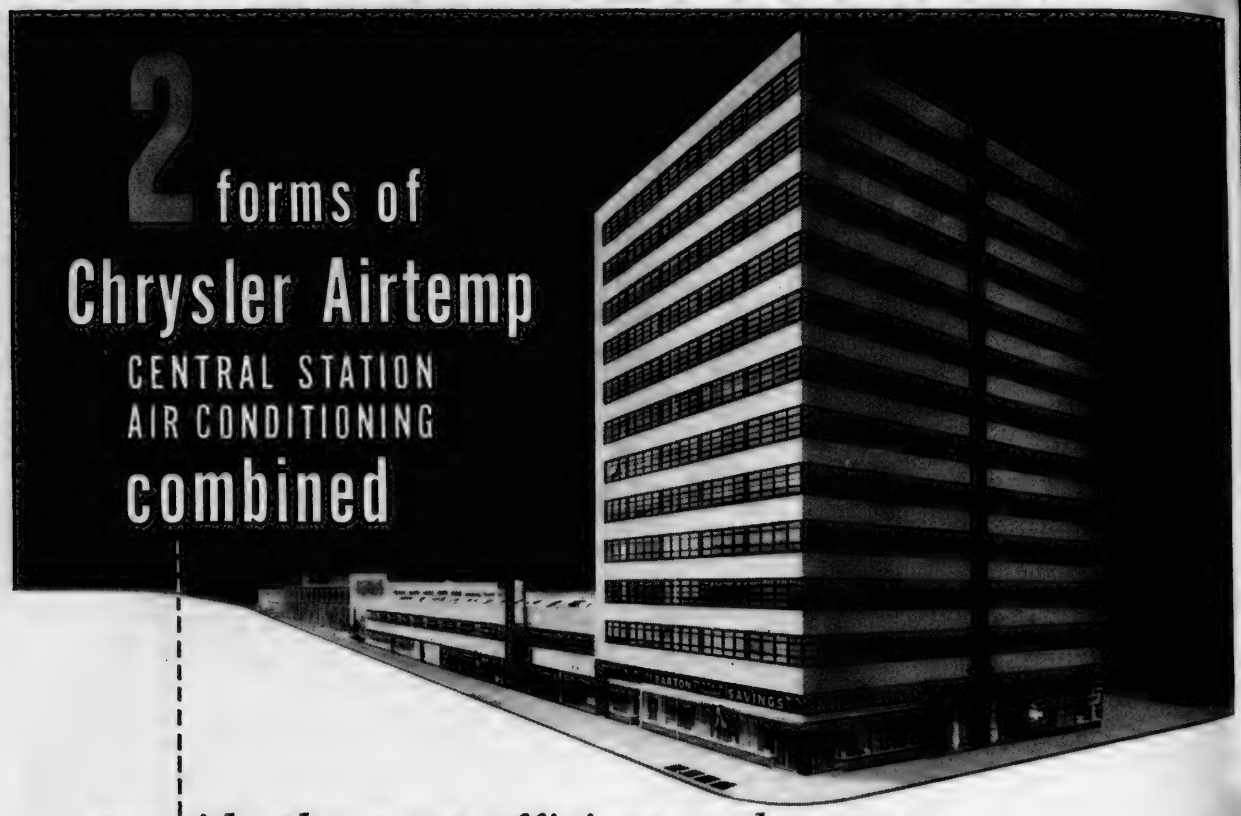
Our representatives will be glad to call upon you and supply the necessary literature and information for your needs.



MASSACHUSETTS BLOWER DIVISION

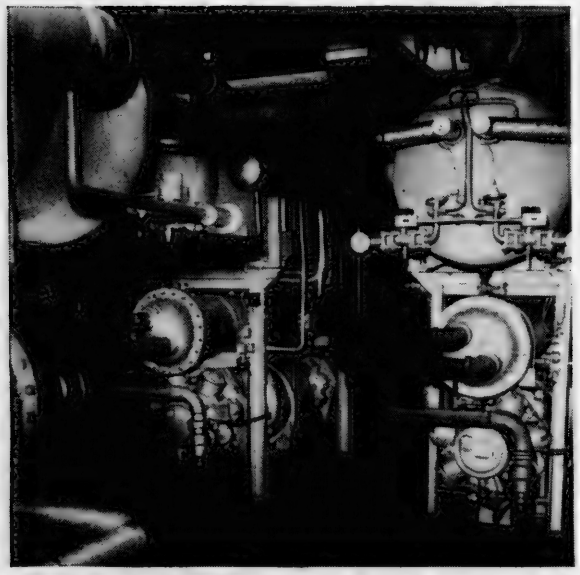
The BISHOP & BABCOCK Mfg. Co.

4901 HAMILTON AVENUE · · CLEVELAND 14, OHIO



provide the most efficient and most economical cooling and heating for Newark's

COMMERCE COURT BUILDING



Five 125 H.P. Chrysler Airtemp "Packaged" Water Chillers provide cooling for Year 'Round Air Conditioning in Commerce Court Building. Heart of each unit is the Chrysler Airtemp Variable Capacity Radial Compressor with exclusive design which reduces compressor weight, saves space. Quiet operation due to perfect balance (no special foundation required!).

In some cases, as in the case of the Commerce Court Building in Newark, N.J., it takes a *combination of two* forms of air conditioning to provide the most efficient and most economical cooling and heating. Here, individual air conditioners of a Chrysler Airtemp Perimeter System serve outside rooms, with chilled water for cooling and warm water for heating piped from a Central Station in the basement. Individual tenants can choose the temperature they want at all times; air conditioning can be shut off completely in any section at any time. Inner areas of each floor are served by a Chrysler Airtemp Central Duct System, with horizontal ducts used to circulate the conditioned air.

Chrysler Airtemp manufactures equipment for every system of modern air conditioning. All of these products are precision-built in a windowless, air conditioned plant. Through Airtemp Construction Corporation, a wholly-owned subsidiary, we offer architects, engineers and contractors a complete air conditioning service. To enlist this service, which can make your job easier, just write Airtemp Division, Chrysler Corporation, Dept. HV, 1600 Webster Street, Dayton 1, Ohio.

CHRYSLER AIRTEMP

HEATING • AIR CONDITIONING

***for* HOMES, BUSINESS, INDUSTRY**

Airtemp Division, Chrysler Corporation, Dayton 1, Ohio

CAUSE FOR ACTION!

PUMPS NEEDED IN A HURRY . . .

AIR FORCE RUSHES SHIPMENT TO BASE

ABOVE: Two-motor cargo plane lands at local air field to pick up rush shipment of ten Skidmore "HS" boiler feed pumps, needed at once, by east coast air base.

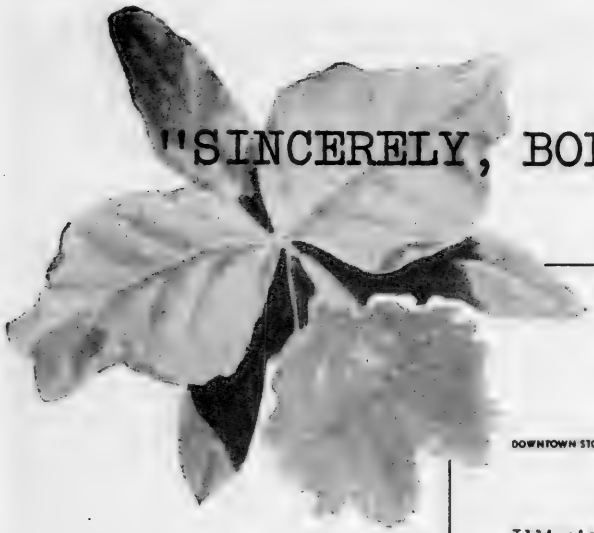
See Bulletin 14-A for full description of this outstanding Skidmore Pump

Here again, "proven performance" was the answer . . . when the Army needed a dependable, low cost pump in a hurry—they specified the Skidmore Type "HS" Pump. Yes, the Army knew from past experience what they were getting—and how soon. Take the *guess work* out of your pump program . . . specify a dependable Skidmore Pump on your next installation.

SKIDMORE PUMPS

SKIDMORE CORPORATION • ST. JOSEPH, MICHIGAN

"SINCERELY, BOESEN THE FLORIST"



Boesen THE florist

DOWNTOWN STORE, 700 GRAND AVE., PHONE 4-6151 STORE AND GREENHOUSE, 3422 BEAVER AVENUE, PHONE 7-4414
DES MOINES 10, IOWA

January 14, 1954

Illinois Engineering Co.
2035 So. Racine Ave.
Chicago, Illinois

Gentlemen:

DURABILITY? → Almost twenty years ago during the depth of the depression, we installed about 110 of your series G. Steam traps in our greenhouses, as a fuel saving measure. The results were excellent and have been to this day. We couldn't have asked for better service.

ECONOMY? → In the days of the depression, spending money for anything, really hurt, but we feel that it was one of the smartest and most timely expenditures that we ever made.

LOW MAINTENANCE? → In the first 15 years of service, your series G. No. 1 traps cost us absolutely nothing in regard to repair and maintenance. To date, only $86.12 has been spent on the maintenance of these traps, which figures out to less than four (.04) cents per trap per year.

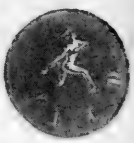
EFFICIENCY? → We also find that for quick line clearance of condensation and air, they simply can't be beat!! They work exceptionally well also, in conjunction with automatic valves where considerable condensation must be handled, especially in mild weather, due to frequent opening and closing of the electrically operated valves.

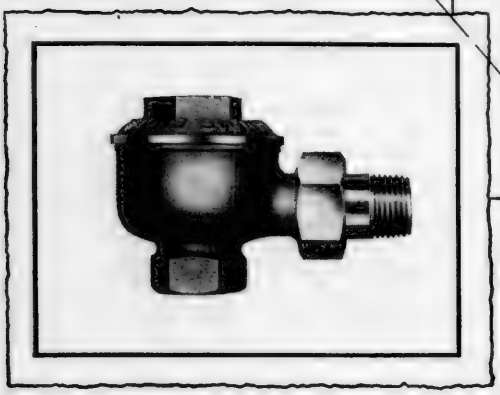
We can't begin to compliment you enough on the excellent service these traps have given us. After over thirty years in the greenhouse business we still haven't found a steam trap of any make, which would do the job that these traps have done for us.

Your Series G. trap is truly a superior product.

Sincerely,
BOESEN THE FLORIST
R. W. Boesen, Sec.

Boesen's Flowers are grown in Des Moines





Write for Bulletin 20

ILLINOIS ENGINEERING COMPANY

illinois ENGINEERING

DIVISION OF AMERICAN AIR FILTER COMPANY, INC.

2035 SOUTH RACINE AVENUE • CHICAGO 8, ILLINOIS

IRON FIREMAN SelecTemp TRADE MARK CENTRAL HEATING

Continuous Modulated Heat with Individual Room Control, for Gas, Oil, or Coal

FOR OFFICE BUILDINGS

The temperature of every office can be regulated to suit individual needs. Temperature stays at thermostat setting regardless of varied heat loss from glass areas, or from cold and warm sides of the building.

FOR APARTMENTS, HOTELS AND MOTELS

Occupants of each room can have the temperature they select without affecting the heat delivered to other rooms. The steam heat is continuous. Room units circulate warmed air, modulated automatically to balance heat loss from each room and maintain the individual temperature selected. No gas or combustion in rooms—no venting required.

FOR HOSPITALS, SCHOOLS, INSTITUTIONS

The varying needs of patients rooms, of service and operating rooms, of offices and public lounges, are met with extreme precision and with almost immediate response to any desired change of temperature. Filtered outside air for ventilation can be introduced when desired. Positive circulation of air within each room but no circulation *between* rooms.

FOR EVERY SIZE AND TYPE OF HOME

Any temperature desired is available in any room, at any time. For example: bathrooms at 75°, living room at 72°, work and play rooms at 65°, and grandmother's room or baby's bath at 78°. Air is warmed by steam, quietly circulated by steam driven fans and cleaned by efficient air filters. Room units have no electrical connections.

A COMPLETELY NEW CONCEPT IN HEATING

Iron Fireman SelecTemp is the only heating system that combines individual room control with continuous, modulated heat, yet initial and maintenance costs are *substantially less* than other zone control systems, with complex electrical equipment. No other system can accomplish these results in such a simple and practical way, or be so easily installed in either old or new construction. Added to this economy is the exceptionally low operating cost. Unused rooms can be kept at low temperature and then heated to a higher temperature, when desired, within a few minutes.

SelecTemp heating gives many important and unique advantages, not only to occupants but to owners and builders as well. For full information, mail the coupon.

SelecTemp TRADE MARK

PRODUCT OF IRON FIREMAN

IRON FIREMAN MANUFACTURING CO.
3156 W. 106th Street, Cleveland 11, Ohio.

Please send literature on Iron Fireman SelecTemp heating.

Name_____

Address_____

City_____ State_____

modern

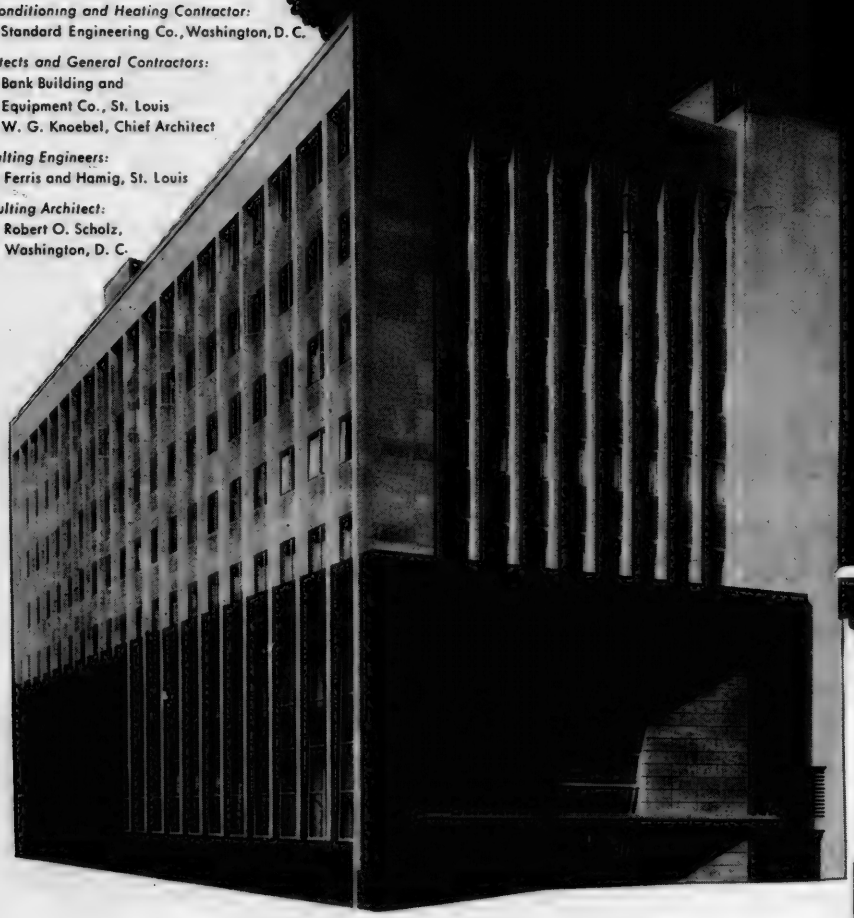
in design... with air conditioning equipment by Marlo

Air Conditioning and Heating Contractor:
Standard Engineering Co., Washington, D. C.

Architects and General Contractors:
Bank Building and
Equipment Co., St. Louis
W. G. Knoebel, Chief Architect

Consulting Engineers:
Ferris and Hamig, St. Louis

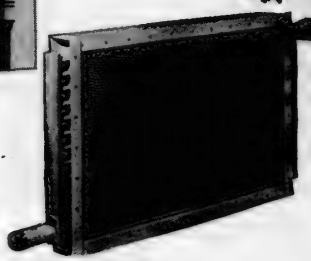
Consulting Architect:
Robert O. Scholz,
Washington, D. C.



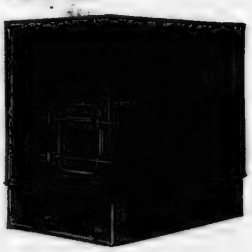
Every detail of this handsome structure in Washington, D. C., was planned to achieve the utmost in beauty, efficiency and luxurious comfort. It is the new home of the Perpetual Building Association.

Year-round air conditioning, of course, is an important feature of the progressive merchandising techniques which have made this 73-year-old company the leader in its field. Marlo Spray Type Dehumidifiers, Marlo Steam Coils and Marlo Water Coils perform a vital service in the winter-summer comfort-conditioning system serving this modern building.

In the complete line of quality Marlo equipment, you'll find the answer to any air conditioning problem. Marlo will be glad to give you complete details. Write today.



STEAM COIL



SPRAY TYPE DEHUMIDIFIER

Marlo COIL COMPANY

Manufacturers of COOLING TOWERS • EVAPORATIVE CONDENSERS • INDUSTRIAL COOLERS • AIR CONDITIONING UNITS • MULTI-ZONE UNITS • BLAST HEATING & COOLING COILS

Saint Louis 10, Missouri

NEW "Small" boiler is a Big Quality package!

Available up to 80 hp — heating or processing — steam or hot water. A complete unit from a single source.

CLEAVER-BROOKS modern C-B boiler

NO BOILER HAS EVER OFFERED SO MANY ADVANTAGES AND QUALITY FEATURES AT SUCH LOW INITIAL COST

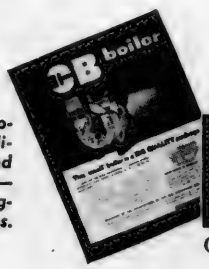
• This NEW CB boiler has EVERYTHING needed to bring *big boiler standards* to commercial, industrial and institutional users with small capacity requirements. Despite its unusual, compact size you get big boiler performance — from matched-quality components, proved the world over on thousands of Cleaver-Brooks self-contained units.

Get all the facts NOW on how the new CB can help you save dollars. Make it a point to see . . . and *hear* the most silent-running, biggest boiler value available anywhere!

gives you all the quality features of time-tested self-contained design

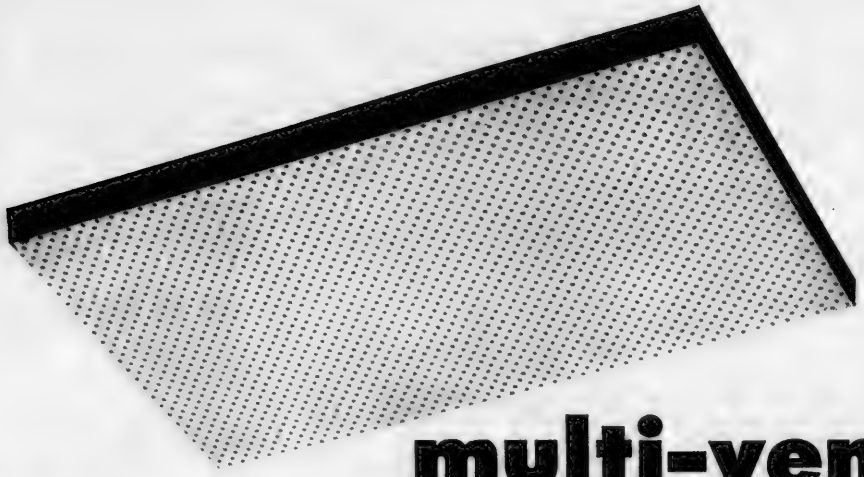
- **FOUR-PASS FIRETUBE CONSTRUCTION** — longer gas travel scrubs heat from flame — means lower fuel costs — guaranteed efficiency of 80% when firing with oil.
- **SILENT OPERATION** — even at peak load this boiler more than meets the low sound levels required for schools, hospitals, institutions.
- **FULL FIVE SQUARE FEET** — of heating surface per boiler hp — for longer service life and low maintenance.
- **FUEL FLEXIBILITY** — burns available light oil, gas, or combination oil/gas — simple, quick fuel changeover on oil/gas models.
- **FAST, EASY MAINTENANCE** — front and rear doors hinged for fast inspection, cleaning or servicing boiler.
- **AUTOMATIC SAFE OPERATION** — all controls centralized and conveniently located — modern electronic combustion control is standard equipment.
- **COOLER BOILER ROOM** — fiber glass blanket insulation and 16 gauge metal sectional lagging are non-corrosive, moisture and heat resistant.
- **FULLY APPROVED** — by Underwriter Laboratories; conforms to ASME codes; factory tested before shipment.

Call your nearest CB boiler representative (see your phone directory) or send for this illustrated catalog describing the NEW CB — designed by Cleaver-Brooks, originators of self-contained boilers.



Cleaver Brooks

Cleaver-Brooks Company, Dept. G, 315 E. Keefe Ave., Milwaukee 12, Wisconsin, U.S.A.
Cable Address: CLEBRO — Milwaukee — All Codes.
Originators of the Self-Contained Boiler



multi-vent®

LOW VELOCITY AIR DIFFUSING PANELS

. . . for heating, ventilating and air conditioning

Specified where *true comfort* . . . or *accurate control* of air movement, temperature and humidity are demanded.

These prominent companies installed Multi-Vent in offices, plants, and laboratories during the past year . . .

Boeing Airplane Co.	International Harvester	Sharp and Dohme
Cincinnati Gas & Power	Eli Lilly & Co.	Southern California Gas
Dow Chemical Co.	Mead Johnson & Co.	Standard Oil Co. of Indiana
E. I. DuPont DeNemours & Co.	Ohio Oil Co.	State Farm Insurance
Employers Mutual Insurance	Pittsburgh Plate Glass	U. S. Steel Corp.
Ford Motor Co.	Rand McNally & Co.	Utica Life Insurance
General Telephone Co.	Sawyer Biscuit Co.	Westinghouse Electric
H. J. Heinz Co.	G. D. Searle Co.	Yale & Towne

True Comfort: Flush or completely concealed in the ceiling, distributing air at low velocities by gentle pressure displacement, Multi-Vent provides truly sightless, soundless, imperceptible air-conditioned comfort unmatched by any other diffuser.

Accurate Control: Multi-Vent's unique ability to handle very high loads and high ventilating requirements, with uniform, low rate of room air motion, meets the most exacting demands of industrial processing and scientific research. Write for detailed literature.

MULTI-VENT DIVISION

Sales and Engineering Representatives in Principal Cities of United States and Canada

THE PYLE-NATIONAL COMPANY

1374 North Kostner Avenue • Chicago 51, Illinois

ELECTRICAL CONDUIT FITTINGS • INDUSTRIAL LIGHTING FIXTURES • STEAM TURBINES

Sound-room tests prove TRI 55 CLAD motors operate at greatly reduced noise level!

Here's the new motor engineered and built for the fast growing air conditioning industry. It's the quieter, more compact G-E Tri/Clad '55' motor, in ratings from 1 to 30 hp a-c.

To reduce noise, G. E. engineers developed a new concept —a sonant motor—a motor that sounds pleasing to the ear. They studied, and then reduced, the causes of motor noise—bearing rattle, magnetic hum, and windage. Sound room tests prove the Tri/Clad '55' is sonant, runs quieter.

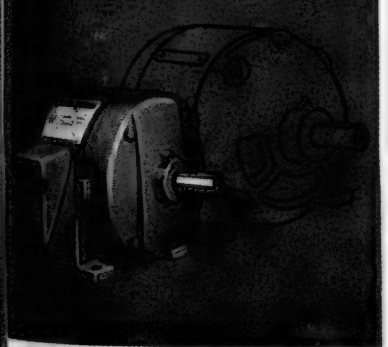
In addition, the modern looking Tri/Clad '55' motor is lighter and smaller—saves weight, saves space.

Try this new motor. See for yourself how the Tri/Clad '55' can help reduce noise and save space in your own equipment. Contact your G-E Apparatus Sales Office or G-E Motor Supplier today. For bulletins, write General Electric Co., Section 648-12, Schenectady 5, New York.

Progress is our most important product

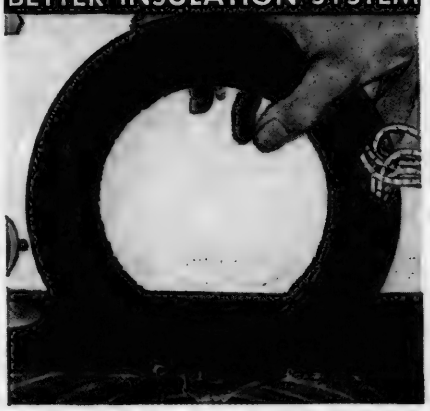
GENERAL ELECTRIC

LIGHTER, SMALLER



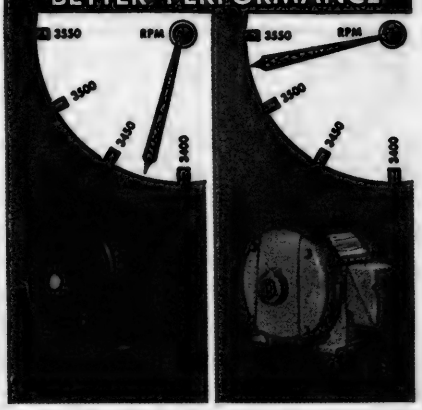
MORE COMPACT MOTOR means more horsepower per pound—saves space, weight—is easier to handle.

BETTER INSULATION SYSTEM



SILICONE RESIN COATING on stator plus stronger polyester-film slot and phase insulation increase electrical life.

BETTER PERFORMANCE



HIGHER FULL LOAD SPEEDS is typical of many performance improvements in the new Tri/Clad '55' motor.

G-E Packaged Units Give Low-cost Air Conditioning in AAA Building

What's the best way to air condition the large building that was never designed for it?

Flexible new General Electric Packaged Air Conditioners provide the answer for A.A.A.'s newly remodeled building in Washington, D.C. Just three G-E units on each floor cool this 30-year-old building. 5, 7½ and 10 horsepower models are used—depending on the space each handles—representing 180 tons in all.

Here's why G-E Packaged Units were selected and why more and more buildings of all kinds are being cooled in this way.

LOW FIRST COST. Equipment is priced surprisingly low. Installation costs are low, too, for remodeling can be held to a minimum. Duct runs are shorter than would be required for a central system. In many applications they are not required at all. No machinery rooms, either.

FIT EVERY APPLICATION. The adaptability of G-E units is unmatched. 3 different sizes were used in the AAA Building, and G.E. makes even more—enough to fit any situation, in-space or out-of-space. They take little floor-space, can be squeezed into corridors and little-used areas.

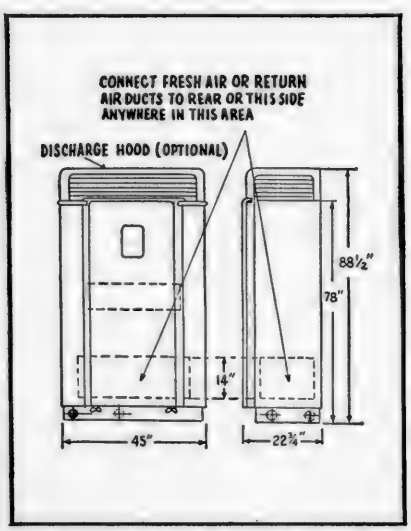
PARTIAL OPERATION. Zoning is simplified. When only part of a building is in use, units in other areas can be shut off, saving money.

G-E 5-YEAR WARRANTY is another advantage over central systems. G.E.'s sealed-in-steel cooling unit is so trouble-free that G.E. provides 5 years' protection (including labor) on the entire refrigeration cycle. Don't forget, with G-E no expensive maintenance crews are needed.

To find out how you can use G-E Packaged Air Conditioners profitably, write General Electric Company, Sec. HV-5, Air Conditioning Division, Bloomfield, N. J.

NEWLY REMODELED American Automobile Association Building in Washington, D. C., is air conditioned by 3 G-E Packaged units on each floor. Architect for remodeling was A. R. Clas; George H. Riggs, Jr., associate. Consulting engineers: Lanier & Levy. General contractor: Wm. P. Lipscomb Co. Mechanical contractor: Morris and Eagan Co.

RECESSED IN CORRIDOR WALL, this 7½-ton G-E unit sends conditioned air to surrounding offices. Air returns through louvers in doors to unit.



DIMENSIONAL DRAWING of Model FD 75G—7½-ton—G-E Packaged Air Conditioner.

FOR BIG DRAFTING ROOM and other areas, G-E 10-ton unit provides quiet, steady cooling. Individual units like this can be turned off when not needed—others can be left on.

Packaged AIR CONDITIONERS

GENERAL ELECTRIC

HOFFMAN "WATCHMAN" CONDENSATION PUMP

TYPE "WC-8-20" Specifications

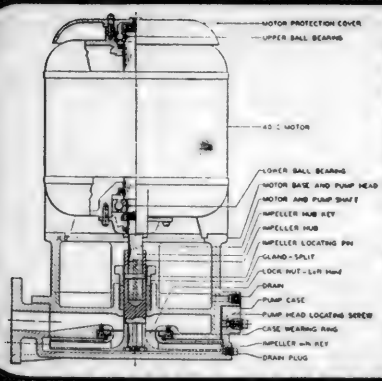
RATING: Up to 8000 Sq. ft. E.D.R.
PUMP CAPACITY: 12 Gals. per min.
PRESSURE: 20 lbs. per square inch at pump discharge
RECEIVER CAPACITY: 9 Gallons
MOTOR: 1/3 H.P., 3450 R.P.M. Single Phase, 60 cycle, 115 or 230 volts
SHIPPING WGT.: 180 pounds

FOR HIGH EFFICIENCY

24" FITS MINIMUM FLOOR SPACE

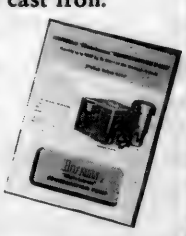
LOW OVER-ALL HEIGHT 16½" MOTOR HIGH ABOVE WATER & DIRT

9" LOW INLET



Here is a vertical, close coupled pump for low pressure heating systems, featuring: 1. One piece cast bronze centrifugal impeller dynamically balanced for smooth running and long life. 2. Receiver of heavy rust resistant cast iron. 3. All operating parts including motor and impeller assembly can be inspected or replaced without disturbing inlet or discharge piping. 4. Two pole heavy duty float switch easily adjusted.

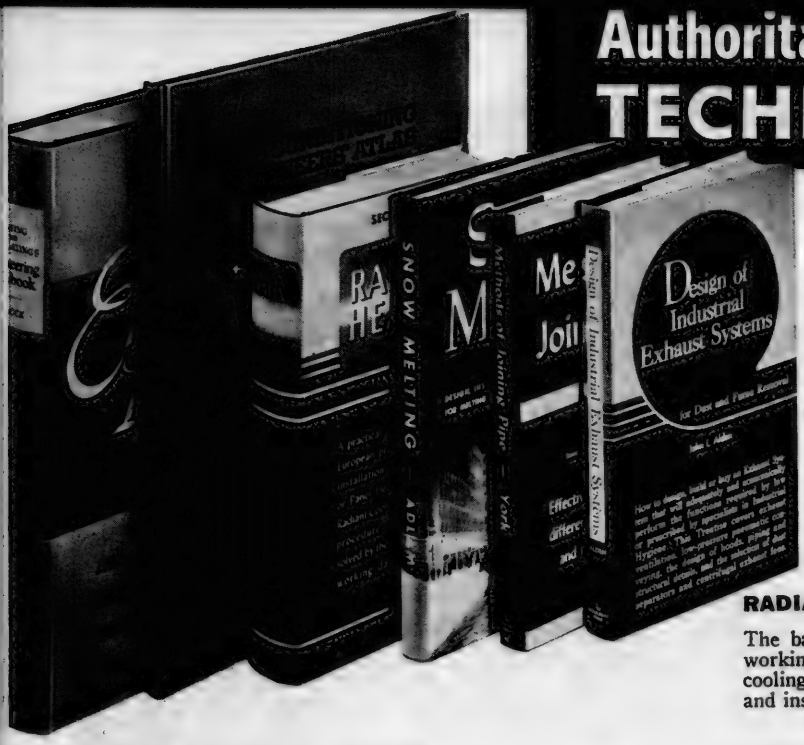
This compact, highly efficient pump is ideal as a replacement for old Boiler Return Trap installations. Immediate delivery can be made from stock. Ask your jobber for full particulars with prices or write for new Hoffman Condensation Pump Catalog, no obligation.



HOFFMAN SPECIALTY MFG. CORP. • 1001 York Street, Indianapolis 7, Indiana

Makers of Vaikon Traps, Hot Water Heating Systems, Oil-burner and Condensation Pumps — Sold by Leading Wholesalers of Heating and Plumbing Equipment

Authoritative, Useful, Practical TECHNICAL BOOKS



Written by outstanding authorities, and published by HEATING AND VENTILATING, these books give Engineers, Contractors, Students and Architects clear, concise answers to many heating, ventilating and air conditioning problems. Use the convenient coupon below to order these books direct from the publisher.

METHODS OF JOINING PIPE
—by J. E. YORK

In no other book will you find so much detailed information on standard and special joints for all types of metallic, glass, tile, plastic and concrete pipe. Also included are data on joints designed to take up movement due to expansion and contraction. Written by a mechanical engineer with many years' experience.

236 pages, 249 illustrations, $3.00. Canadian or foreign postage, 55¢

RADIANT HEATING—2nd Edition
—by T. NAPIER ADLAM

The basic principles, the experience-proved facts, the practical working data on applications of radiant energy for heating and cooling. Facts and figures can be applied directly in designing and installing radiant heating systems.

504 pages, 337 illustrations, $6.00. Canadian or foreign postage, 75¢

HEATING AND VENTILATING'S ENGINEERING DATABOOK—by CLIFFORD STROCK

Essential working data and practical information on heating, piping, air conditioning, ventilation, air sanitation and refrigeration for design, installation and operating engineers. Time-saving tables and large scale charts greatly simplify everyday estimating and design problems.

576 pages, 8½" x 11", $7.00. Canadian or foreign postage, $1.00

PIPEFITTERS HANDBOOK—by FORREST R. LINDSEY

Original tables, based on practical experience which enable pipefitters to solve problems of pipe bending, mitering, layout, threading, etc. either in the shop or in the field. Convenient pocket size, flexible Fabrikoid binding.

282 pages, $6.00
Canadian or foreign postage, 65¢

SNOW MELTING—by T. NAPIER ADLAM

A valuable handbook of correct, *tested* practice that covers the steps in planning, designing, building and operating snow melting systems of all sizes and types. Time-saving charts, tables and graphs give all the necessary data and simplify every step from preliminary planning to final operation.

224 pages, 189 illustrations, $4.50. Canadian or foreign postage, 55¢

FUEL OIL MANUAL—by PAUL F. SCHMIDT

Covers characteristics and uses of every type and grade of fuel oil. Explains the meaning of each oil property, and shows how this information is applied in selecting, handling and burning fuel oil.

160 pages, 34 tables, $3.50. Canadian or foreign postage, 55¢

DESIGN OF INDUSTRIAL EXHAUST SYSTEMS—by JOHN L. ALDEN

How to design, build or buy an exhaust system that will perform its functions adequately and economically, and meet the requirements of law and industrial hygiene. Covers flow of fluids—hood forms—air flow through hoods—pipe resistance—piping design—dust separators—low pressure conveyors—centrifugal exhaust fans—structural details—field measurements and their interpretation.

252 pages, 122 illustrations, $3.50. Canadian or foreign postage, 60¢

INDUSTRIAL HEAT TRANSFER
—by F. W. HUTCHINSON

A combined text and reference book that provides time-saving working graphs for the direct solution or most commonly encountered problems.

336 pages, 136 charts and illustrations, $6.00. Canadian or foreign postage, 65¢

EXHAUST HOODS—by J. M. DALLA VALLE

Practical hood design, including the latest principles of air handling, contiminant dilution and transport velocities. Includes design of hoods for control of dust, mist, fumes, vapors and gases, with simple formulas and diagrams showing exact procedures.

130 pages, 127 illustrations, $3.50.
Canadian or foreign postage, 55¢

CONTRACTS SIMPLIFIED—by LEO T. PARKER

Heating, ventilating and air conditioning cases involving higher court decisions analyzed to clarify the law of contracts, chattel mortgages, and real estate law, the legal status of independent contractors, and patent law.

26 pages, paper bound, $1.00.

FLUID FLOW IN PIPES—by CLIFFORD McCLAIN

How to solve problems involving the flow of liquids and gases through pipes. Shows how to handle viscosity, friction, head, and other factors expressed in various dimensional systems. Each phase illustrated with practical examples.

124 pages, 18 illustrations, $3.00. Canadian or foreign postage, 40¢

ORDER FORM

HEATING AND VENTILATING, 148 Lafayette Street, New York 13, N. Y.

Please send me the books checked below:

- ☐ RADIANT HEATING
- ☐ HEATING AND VENTILATING'S ENGINEERING DATABOOK
- ☐ SNOW MELTING
- ☐ DESIGN OF INDUSTRIAL EXHAUST SYSTEMS
- ☐ METHODS OF JOINING PIPE
- ☐ PIPEFITTERS HANDBOOK
- ☐ FUEL OIL MANUAL
- ☐ INDUSTRIAL HEAT TRANSFER
- ☐ CONTRACTS SIMPLIFIED
- ☐ FLUID FLOW IN PIPES
- ☐ EXHAUST HOODS

Name .....

Company ..... Street and No. .....

City ..... Zone ..... State .....

Home Address .....

(Please fill in if you want books sent to your home)

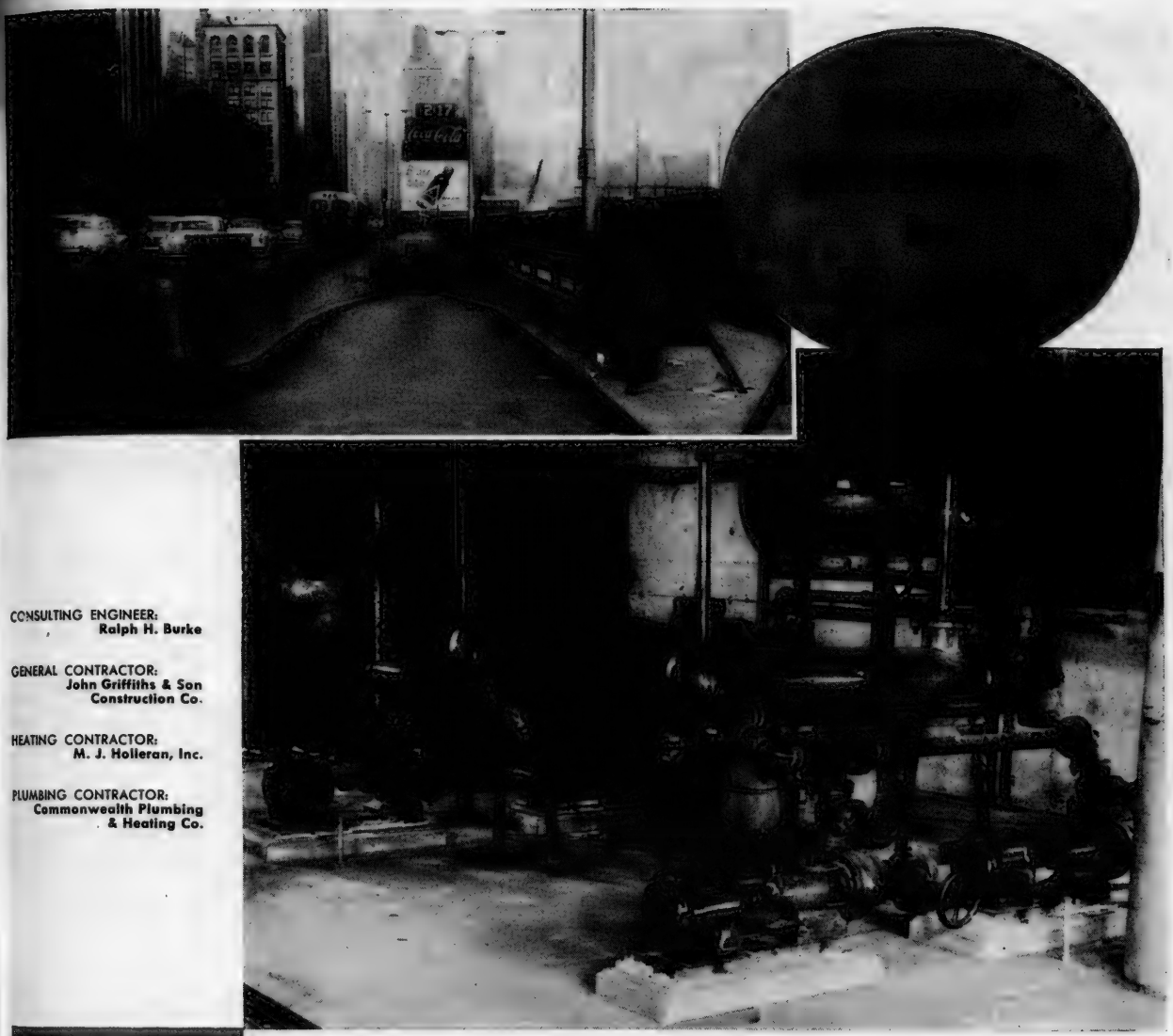
CHOOSE YOUR MOST CONVENIENT METHOD OF PAYMENT

☐ I enclose check or money order in full payment.

☐ I enclose 1/3 down payment (for order amounts to $6.00 or more) and will pay balance in monthly installments. ($6.00 to $9.00, two additional installments, $10.00 to $20.00, three additional installments. $21.00 to $30.00, four additional installments.)

☐ Send books postpaid. I will pay within five days if I decide to keep books.

6/54



CONSULTING ENGINEER:
Ralph H. Burke

GENERAL CONTRACTOR:
John Griffiths & Son Construction Co.

HEATING CONTRACTOR:
M. J. Holleran, Inc.

PLUMBING CONTRACTOR:
Commonwealth Plumbing & Heating Co.

Chicago's Michigan Avenue underground garage uses B & G Equipment to keep drives free of snow and ice

In the installation above, forced hot water heating is shown in a notable application as a traffic safety measure. Water heated in B & G steam convertors is circulated by B & G pumps through pipe coils under the ramps of Chicago's huge underground garage...assuring safe, unimpeded driving in any weather.

Dependable performance of equipment in an installation of this kind is obviously a prime consideration. There is no surer warranty of such performance than to specify "B & G."

The reasons for the universal acceptance of B & G *Hydro-Flo* Products can be summed up in a single sentence—"Sound engineering backed up by modern manufacturing methods capable of translating good design into fine product."

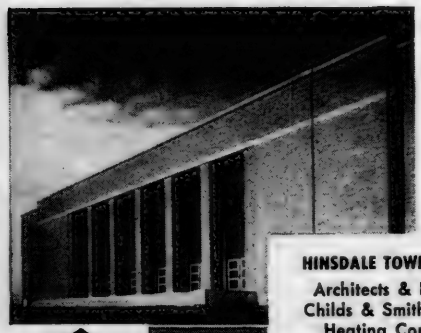
When you specify "B & G" you can be sure that full value will be delivered—in operating economy—in dependability—and in long service.

For full information on B & G *Hydro-Flo* Products, send for the B & G General Catalog

BELL & GOSSETT
COMPANY
Dept. DL-4, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto, Canada

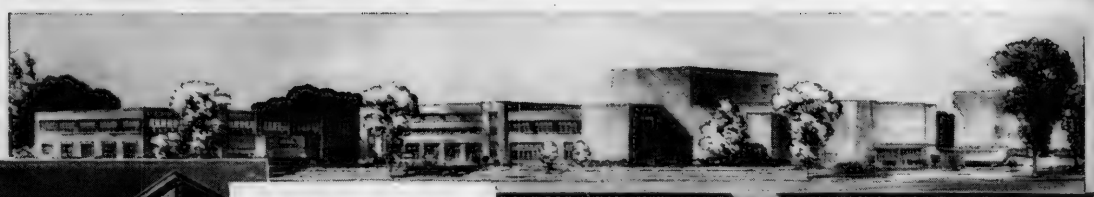
5-MILLION DOLLARS IN HIGH SCHOOLS



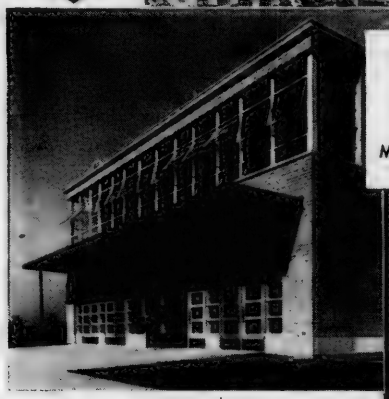
Gymnasium section, Hinsdale H. S.

HINSDALE TOWNSHIP H. S.
Architects & Engineers
Childs & Smith, Chicago
Heating Contractors
William A. Pope Co., Chicago

Auditorium section, Maine Township H. S.



MAINE TOWNSHIP H. S.
Architects & Engineers
Childs & Smith, Chicago
Heating Contractors
M. J. Holleran, Inc., Chicago



Famous 600-ft. corridor, Maine Township H. S.

The great combination: Marsh packless — *truly packless* — radiator valve and the trouble-free Marsh thermostatic trap.

The Marsh float and thermostatic trap. There is a Marsh trap for every heating service.

Marsh Valves and Traps all the way through

The answer of three Chicago suburbs to the bumper crop of teen-agers . . . these two college-size high schools. Among America's largest and finest, they cost 5 millions and contain 337,000 sq. ft. of efficiently utilized floor space.

The fabulous, 3-million dollar expansion of Maine Township High will serve the suburbs of Park Ridge and Desplaines. Hinsdale High, a 2-million dollar high school, is for the young folk of famous Hinsdale alone. Who says we are not catching up with schooling needs? That 600 ft. corridor in the Maine Township school sets a standard of architectural design and quality construction never before found in the nation's schools.

For the best in buildings, the best in heating of course . . . and for the radiators and coils, the best in valves and traps. Hundreds of Marsh Packless Radiator Valves, Radiator Traps and F & T Traps went into the well designed heating systems which involve both direct and indirect radiation.

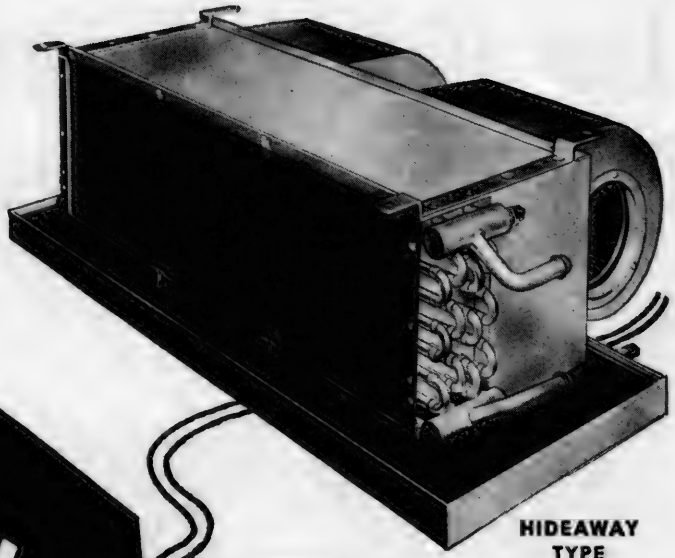
An excellent example, this — but only one of many examples of the respect for Marsh quality demonstrated on a nation-wide scale in the selection of Marsh equipment by foremost architects and contractors. Ask for Catalog 76-H covering the full line of Marsh Heating Specialties.

MARSH HEATING EQUIPMENT CO., *Sales Affiliate of Jas. P. Marsh Corporation* **Dept. U, Skokie, Illinois**

MARSH Heating Specialties

REMOTE ROOM AIR CONDITIONERS

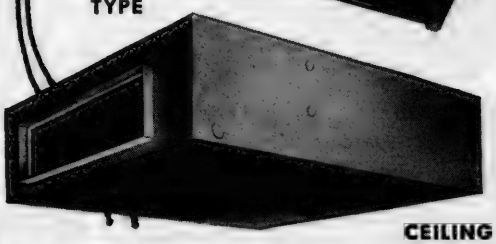
for existing buildings or new construction



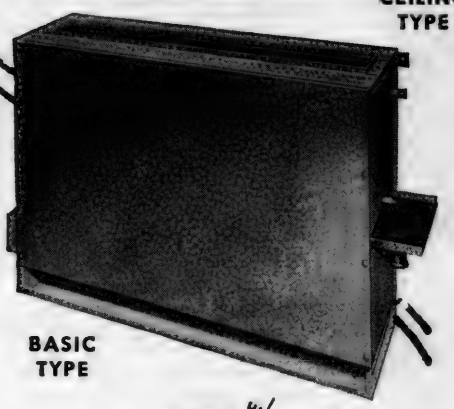
HIDEAWAY TYPE

McQuay SEASONMAKERS

FLOOR TYPE



CEILING TYPE



BASIC TYPE

For hotels, tourist courts, apartment houses, office buildings, hospitals or residences—new or old construction, the famous family of McQuay Seasonmakers gives you widest flexibility in planning individual room air conditioning.

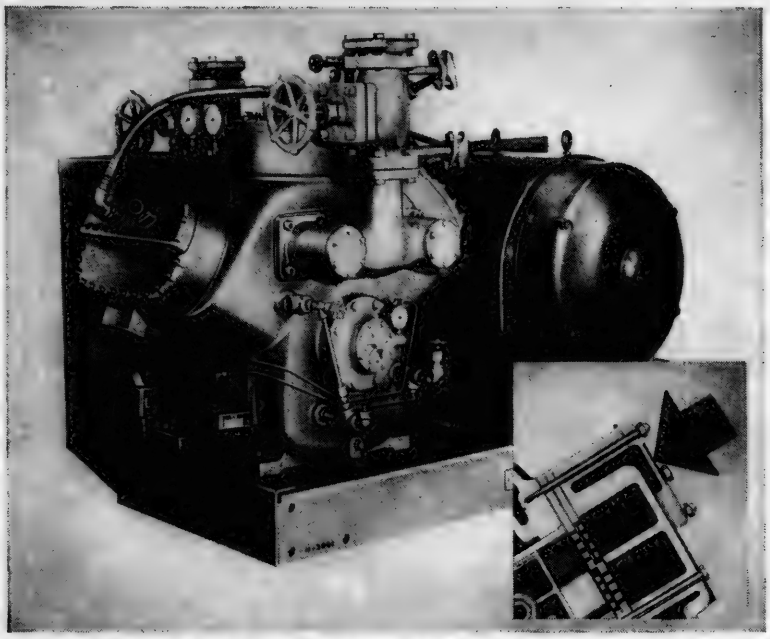
The popular HIDEAWAY, newest member of the Seasonmaker family, meets the requirement for a unit especially designed for concealed mounting, in furred ceilings, closets, vestibules and wherever space is at a premium. Available also in Floor type, for free standing mounting; Basic type, for fully recessed wall installations; and Ceiling type, for suspended mounting. The four types in three different sizes, 200, 400 and 600 CFM, simplify selection of the right unit for the job.

Exclusive Ripple-Fin coil construction assures long life and dependable service. All Seasonmakers are designed for quiet operation and for easy installation and maintenance. Get complete details on features and specifications in Bulletin 703. Representatives in principal cities or write McQuay Inc., 1619 Broadway N.E., Minneapolis 13, Minnesota.

McQuay INC.

★ AIR CONDITIONING ★ REFRIGERATION ★ HEATING

Look at all the features of Worthington's new high-speed ammonia compressor



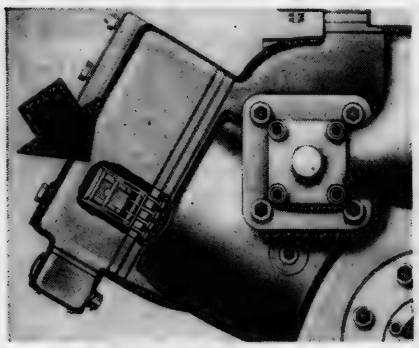
IMPROVED INTERNAL MANIFOLDING—cool suction gas completely surrounds the cylinder walls, providing longer valve life and increased overall efficiency. All passageways between suction discharge and shutoff valves are cast integrally within the crankcase, eliminating outboard fittings. Cross section shows water jacketing on one of the cylinders.

High operating efficiency and lighter weight make this modern unit the talk of the industry

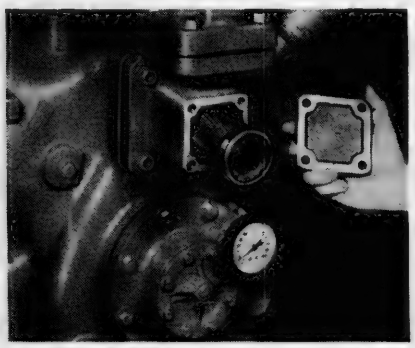
These lightweight, compact Worthington ammonia compressors have the same high operating efficiency and versatility as their lower speed counterparts.

Ranging in capacities from 18 to 150 tons, the new units can be used as high-stage or booster machines.

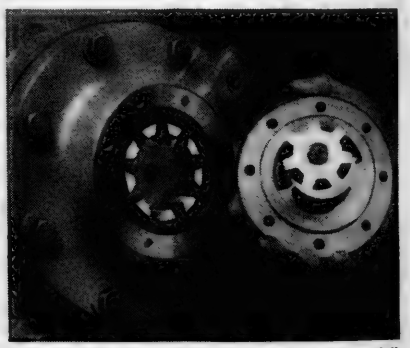
Get in touch with your nearest Worthington district office for more facts about these rugged compressors. Or write to Worthington Corporation, Air Conditioning and Refrigeration Division, Section A.3.56, Holyoke, Mass.



ELECTRIC UNLOADING—a new achievement in variable capacity control. You can start compressor with a normal torque motor; power consumption is automatically balanced against load. Separate unloader units allow easy maintenance . . . no oil or gas pressure lines to worry about.



NEW SUCTION MANIFOLD, with cover plate over suction strainer inlet, allows easy removal of the suction gas strainer for cleaning, without disturbing any of the pipes, valves or other parts. The strainer is unique in that it fits entirely within the crankcase manifold, requiring no additional space.



NEW FORCE-FEED LUBRICATION SYSTEM—full pressure, positive lubrication, regardless of rotation. A new rotary oil pump, driven directly by the crankshaft, eliminates complicated and noisy gear trains. Oil is filtered through a strainer in the crankcase for protection of pump and other moving parts.

A.3.56

WORTHINGTON

CLIMATE ENGINEERS TO INDUSTRY, BUSINESS AND THE HOME

Announcing

kno·draft

panel type air diffusers

ACTUALLY PART of the ceiling, Kno-Draft Panel Type Air Diffusers fit precisely into the acoustical tile pattern, creating a unified "dead level" surface that is pleasing to the eye.

FLEXIBLE TUBING connects Kno-Draft Panels to ducts, permits wide latitude in installation. Panels may be moved as necessary without affecting efficiency or requiring change in ductwork.

ESPECIALLY DESIGNED for acoustical suspended ceilings, Kno-Draft Panel Type Air Diffusers can be installed as fast and easily as the acoustical tiles themselves—a matter of minutes. Ducts and tubing connections are readily accessible.

Furthermore, Kno-Draft Panels do not have to be lined up with ducts. They can be placed anywhere on the ceiling—are connected to ducts by special patented flexible tubing. This allows great flexibility and permits relocation of offices and partitions without moving ductwork.

Air volume through Kno-Draft Diffusers is adjustable *after* installation. Air velocities remain constant at all damper settings. Mail coupon today for full information on this new exclusive development in air diffusion. Connor Engineering Corporation, Danbury, Conn.

CONNOR

kno·draft®

panel type air diffusers

see our catalog in Sweet's or write for copy

CONNOR ENGINEERING CORP.
Dept. J-64, Danbury, Connecticut

Without obligation, please send your Bulletin K-36 describing the new Kno-Draft Panel Type Air Diffusers.

Name_____

Position_____

Company_____

Street_____

City_____ Zone____ State_____

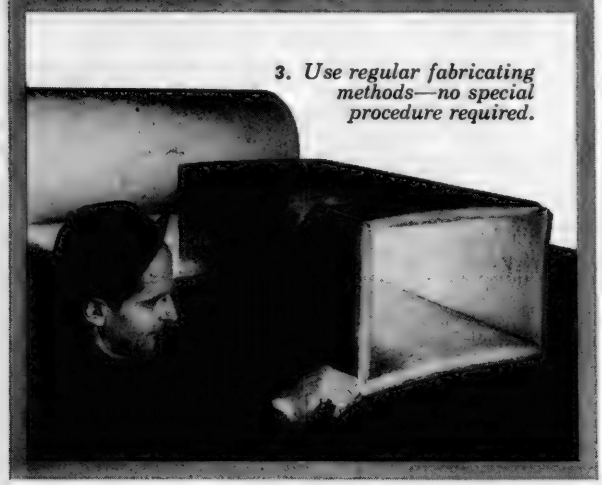
If your business is insulating ducts, here's important news:

New MICROLITE Duct Liner | coated or uncoated

a wonderfully soft, light weight, highly manageable glass fiber insulating material with excellent acoustical and thermal properties

1. With knife or shears cut off required length and apply with regular adhesive to sheet metal.

2. Form insulated duct section in the brake in the usual way.



3. Use regular fabricating methods—no special procedure required.

Now, Glass Fibers Inc. brings you a duct liner that is a pleasure to handle and install, and is a highly efficient acoustical and thermal insulator. Chalk up another achievement for Glass Fibers' exclusive Electronic-Extrusion process, which makes possible the long, uniform fibers responsible for the insulating and mechanical superiorities of this new duct liner.

Sound Absorption Value is excellent: ½" liner has a noise reduction coefficient of .60; 1" of .75.

Thermal Qualities are also excellent: "k" value of .20 at 50°, .21 at 75°, .23 at 100°, .27 at 150°, .31 at 200°.

Light Weight: 1" liner with coating on one side weighs less than 2¼ ounces per square foot.

Air Erosion Resistance: Microlite coated duct liner is recommended for air velocities of 1500 feet per minute or over. For movements up to 1500 feet per minute, uncoated will perform satisfactorily.

Can Be Formed in Brake: Cut required length with knife or shears; apply to sheet metal with adhesive; insulated duct section can then easily be formed in the brake. On large ducts, upper surface of horizontal runs should be applied with adhesive plus mechanical clips.

Ready Made Ducts and Fittings: Microlite duct liner can be installed by the "wrap-in" method, using regular adhesives. Precision cutting and fitting of separate pieces, as in the use of rigid insulation, is not necessary.

Microlite Duct Liner is available in 24", 36" and 48" widths; half inch in 200 foot rolls; one inch in 100 foot rolls.

For a technical bulletin and sample, and name of your nearest distributor, write to Glass Fibers Inc., 1810 Madison Avenue, Toledo 2, Ohio.

VITRON Glass Textile Yarns • Rovings • Micro-Fibers
DURAMAT Vapor Barriers • **BLUE FLAG** Pipe Wrap
MICROLITE Thermal and Acoustical Insulation
VIBRAGLASS Mounting and Packaging Materials
COUSTIC-AIRE and **THERMO-JET** Aircraft Insulations

GLASS FIBERS INC.

Makers of glass fibers by the ELECTRONIC-EXTRUSION process . . . developed, patented and used exclusively by Glass Fibers Inc.

- Four sizes — 6600 to 18,000 BTU/hr.
- Two speed fan control.
- Horizontal or Vertical models supplied with water or DX coils.

You don't have to dig up applications for BUSH Remote Air Conditioning Units. They're everywhere: hotels, motels, hospitals, office buildings . . . all types of multi-room installations.

The spade work's been done. Owners and executives realize that year 'round air conditioning is a *must*. They readily recognize BUSH units as the answer to their needs.

Prospects will appreciate your presenting the practical, "sell-themselves" features of these handsome units. They'll especially like the shallow depth front to back that permits full use of room space . . . the low noise level and quiet operation . . . the fact that fan, motor and drain pan is one complete assembly — eliminating the necessity of any "in-the-room" fussing during cleaning or maintenance.

Chart your course to greater profits now . . . request free descriptive literature.

BUSH MANUFACTURING COMPANY
WEST HARTFORD 10, CONNECTICUT

BUSH

Check the reasons why the popular choice for summer cooling and winter heating is

the individually-controlled unit that filters and circulates the air all year 'round in central-plant, multi-room installations

Architects, builders and heating contractors like the Remotaire because it's versatile, easy and economical to install, space saving.

Building owners like the Remotaire because it provides healthful, draft-free comfort conditioning all year 'round with minimum attention.

- Same simple piping circuit supplies chilled water for summer cooling, hot water for winter heating. No unwieldy ductwork needed.
- The Remotaire is adaptable to the best system for the job—Wall Aperture System, Interior Ventilation System, Well Water System, Split-coil System, Motel System, Residential System, Modernization System.
- Units can be installed recessed, partially recessed or free-standing.
- Three popular sizes to choose from—200, 400, 600 cfm. A size for every job.
- Easy to service. Every part of the assembly can be reached easily, quickly.
- Easy to maintain. Motor assembly can be taken out and replaced in less than 15 minutes.
- Reversible coil is designed for right or left hand connection. Easily reversed in the field.
- Special electrical junction box is easy to get to.
- Sturdily built . . . doesn't have to be pampered in installation. (Reinforced grille will support weight of 200 lb. man!)
- Each unit is individually controlled . . . temperature in each room can be changed without affecting adjoining space.
- The Remotaire is quiet. No whistling-jet noises.
- Handsome jacket, furnished in semi-gloss Cooltan, can be painted any color.
- Toe-step offset permits better fitting of rugs around units and eliminates marring of front when cleaning floors.
- Drain pan protection. Large pan runs entire length of unit to prevent condensation drip. Grille shield prevents foreign matter from entering through top.
- Large filters . . . keep air fresh and clean.
- Adjustable damper. Amount of air intake can be changed at any time.
- Wall seal. Rubber molding around back panel provides air seal between unit and uneven plaster.

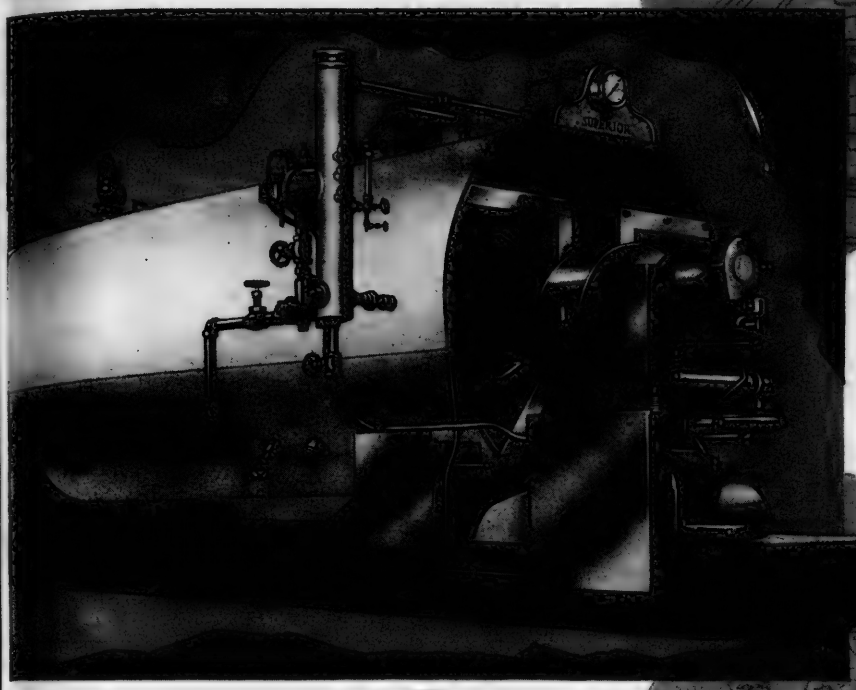
For further information on the Remotaire see Sweet's Architectural File or contact your nearest American-Standard sales office for descriptive literature.

AMERICAN-Standard
HEATING-COOLING SYSTEMS

American Radiator & Standard Sanitary Corporation, P. O. Box 1226, Pittsburgh 30, Pa.

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

GOOD FOR THE *Plant*



GOOD FOR THE *Budget*

SUPERIOR STEAM GENERATORS are the ideal source of steam for heat or process. Completely *factory assembled,* and *factory tested* to insure capacity operation at thermal efficiencies guaranteed to exceed 80%, they are backed by undivided responsibility. Installation is simple and inexpensive. Rugged and compact, they need no special foundation, fit in limited space with low overhead.

Superior's *built-in* induced draft eliminates the need of an expensive chimney and avoids the forcing of combustion gases into the boiler room.

Superior Steam Generators reduce maintenance to a minimum and in many cases earn their total cost in less than 2 years through operating economies resulting from high efficiency.

Dependable, quiet performance, plus economies of installation and operation, make Superior the ideal steam plant.

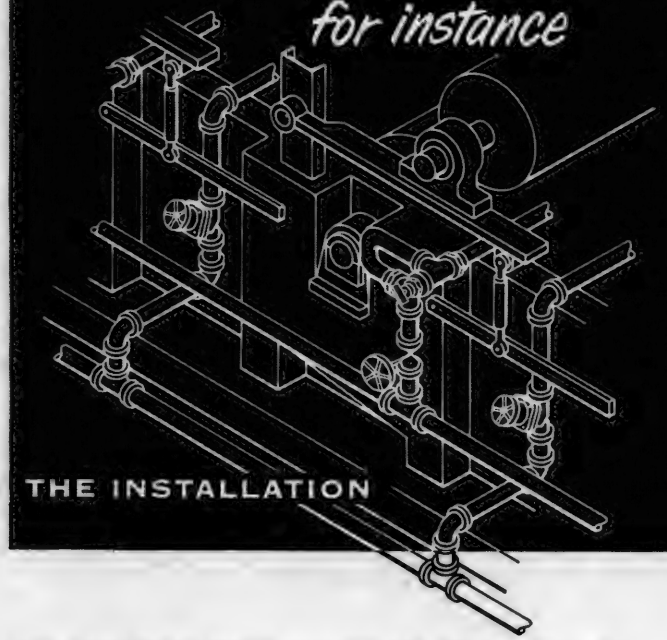
Fully automatic, Superior Steam Generators burn gas, oil, or both. Sizes from 20 to 600 bhp. for pressures to 250 psi. or for hot water. Battery installations provide maximum flexibility for higher capacities. Write for catalog 619.

for performance you can **BANK** *on*

SUPERIOR
STEAM GENERATORS

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

Doing What Other Valves Couldn't ...on Slurry Service, for instance



THE INSTALLATION

Crane Diaphragm Valves on slurry-like white water service to cylinder tanks on paper-making machines at Excello Paper Products Co., Inc., Cincinnati.

VALVE SERVICE RATINGS

SUITABILITY:	"Made to Order" for tough jobs
FEATURES:	Seats tight where others fail
MAINTENANCE COST:	None – needs no attention
SERVICE LIFE:	Many times longer than expected
OPERATING RESULT:	Plant efficiency improved
AVAILABILITY:	Crane Catalog item – No. 1610

THE CASE HISTORY

Valves formerly used had been giving much trouble that started between tank fillings. While many replacements were tried, none of the valves could handle the white water solids and fibers that built up in the bonnet and seats between operations. Result was the valves were hard to operate, and leaked at the seats.

Keeping up with valve maintenance and the hazardous, messy floors caused by white water leakage was costly and annoying. But it was a problem that Crane Diaphragm Valves solved handily. The leakage stopped—machine room efficiency went up as the safety hazard was gone—plant appearance improved. Installed about a year ago, Crane Diaphragm Valves keep doing these things without a penny's maintenance cost to date.

THE VALVE

Crane Diaphragm Valves are packless. Bonnet and working parts are sealed to line fluid; there's no place for sediment to build up. Independent disc and diaphragm design saves wear on diaphragm, permits valve to be closed even should diaphragm fail. Pliable disc insert seats tight on foreign particles that cause leakage and wire drawing in ordinary valves. Choose these valves from wide variety of body and trim materials for corrosive, abrasive, and ordinary services. See your Crane Catalog or Crane Representative.

Protected by U. S. and foreign patents.

THE BETTER QUALITY... BIGGER VALUE LINE... IN BRASS, STEEL, IRON

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

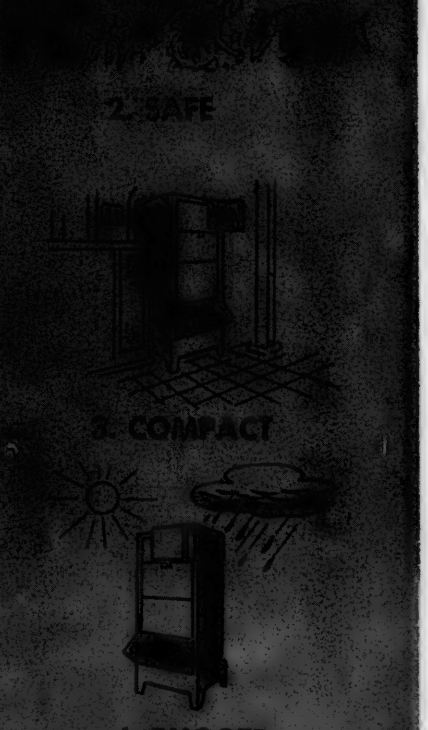
VALVES • FITTINGS • PIPE • PLUMBING • HEATING

KENNARD Engineered KT

HOME or BUSINESS

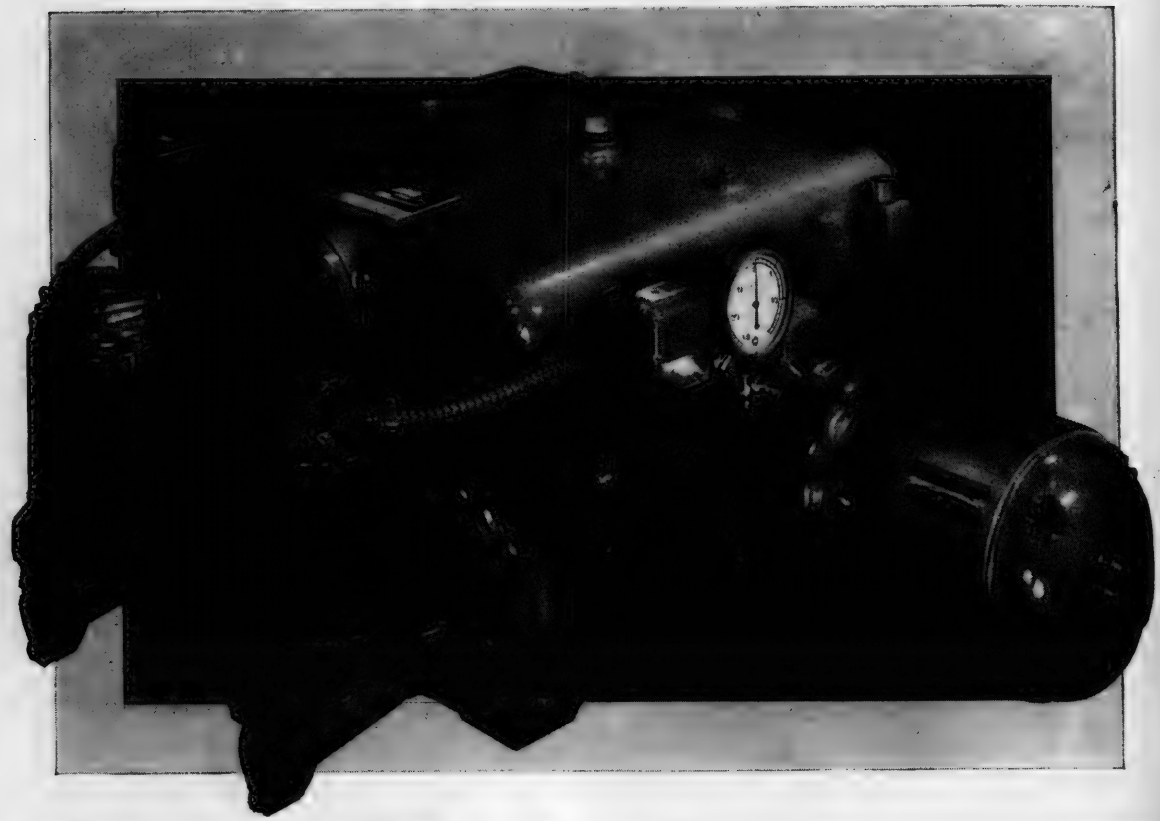
KENNARD KT Water Savers (Induced Draft Cooling Towers) are ready for you NOW! Outstanding features found in KT Water Savers—Centrifugal type fan, redwood wetted deck, galvanized construction throughout, engineered for long life—OUTDOOR or INDOOR. Sized to meet popular demand, 3, 5, 8, 11 & 16 tons. Catalog KT-2.

Complete line of Cooling Towers—20 thru 75 tons. Cat. CT-1



KENNARD CORPORATION
1823 S. HANLEY RD. • ST. LOUIS 17, MO.

THIS NEW VACUUM HEATING PUMP IS SIZED TO ACTUAL JOB REQUIREMENTS



It's the Nash CSM

No longer is it necessary for the Engineer to accept a vacuum heating pump with air and water capacities based inflexibly upon square feet of equivalent direct radiation. With the flexible Nash CSM he can provide for proper air capacity in accordance with his judgment and experience. For the individual capacities of the separate pumps on the CSM may be varied within a wide range, without buying an oversize receiver and oversize water pumps.

These pumps possess many other features which permit a more efficient utilization of fuel and minimum use of electric power. Low, low, returns reduce installation costs and usually eliminate putting the pump in a pit. Simplicity and efficient operation reduce supervision and maintenance costs. Information regarding this new heating pump development is available immediately upon request.

- Increased air capacity induces rapid system response without wasteful overheating.
- Separate air and water pumps individually selected to meet actual job requirements.
- Control system that operates individual pumps only when needed.
- Flexibility permitting addition of radiation without changing basic pump installation.
- Low, low, return line connection.

NASH ENGINEERING COMPANY
438 WILSON, SO. NORWALK, CONN.

Centrifugal Pump Types and Trends

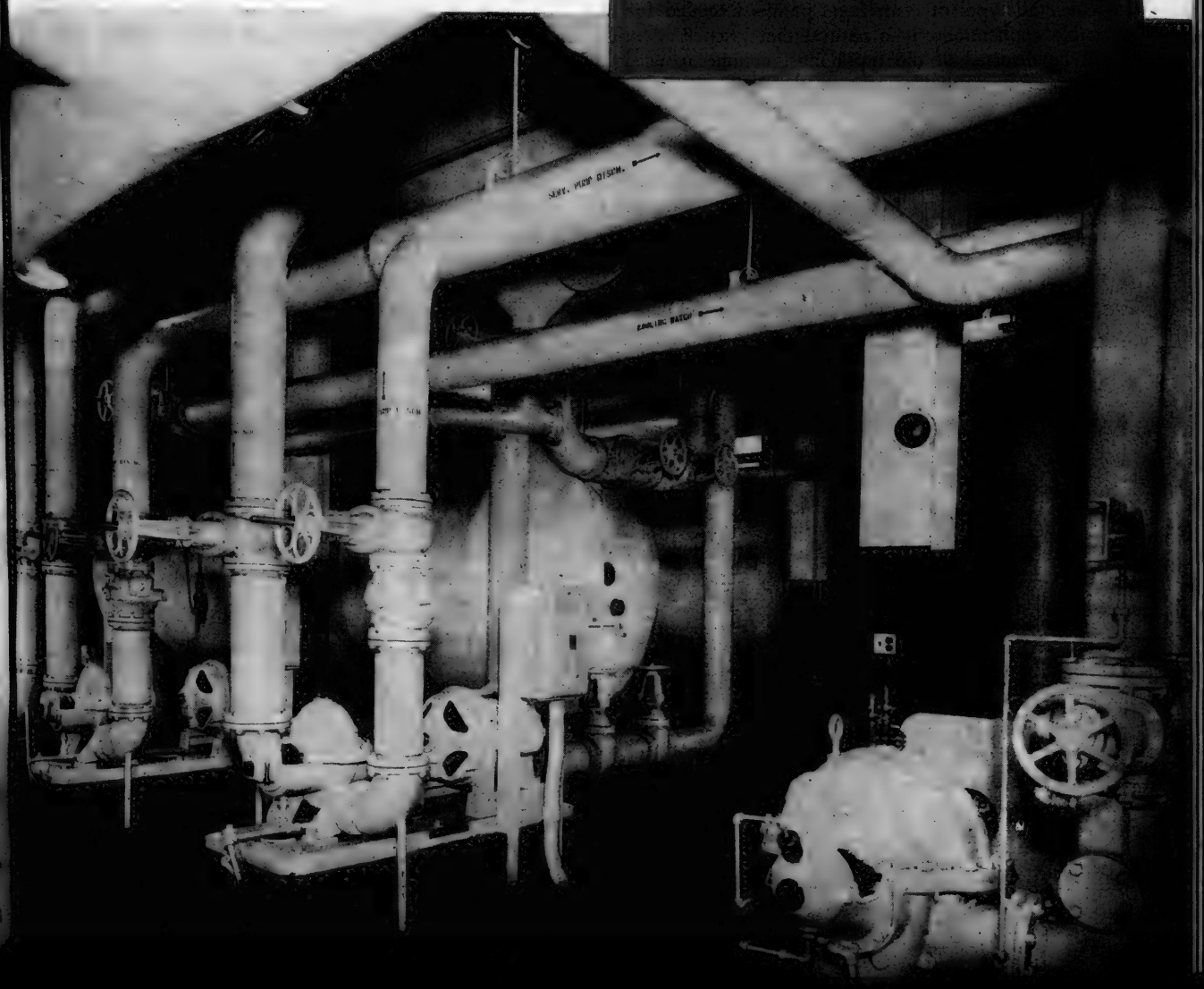
IGOR J. KARASSIK
and
ROY CARTER

Centrifugal Pump Division, Worthington Corporation

This is the first of a series of articles on centrifugal pump design and selection. Each article will be an independent discussion of one or more factors affecting pump performance. This month the authors describe the various types available, the effect of speed, the trend in size, and the causes of noise.

THE centrifugal pump is constantly growing in importance not only in industrial processes, but also in its application to various building services, such as heating, ventilating and air-conditioning. While originally the centrifugal pump was developed for the movement of large volumes of liquids against rather low heads, today it has displaced the older direct acting pump in a very large range of service conditions. The increasing availability of electric power has made the lighter, more economical centrifugal pump, direct driven by an electric motor, the ideal type for many applications.

One advantage of the centrifugal pump is that it can give a steady flow at uniform pressures without the pressure surges of the reciprocating pump. The pressure which a given pump can develop is limited by its design features and in most cases it can operate without the need of relief valves. Finally, it provides a great deal of flexibility, as its delivery can be controlled either by



varying the speed of operation or, more commonly, by throttling.

During the last fifty years, the field of application of centrifugal pumps has been widely enlarged both as to pressure and capacity. Centrifugal pumps have been built for as little as a few gallons per minute to the mammoth 144-inch pumps at Grand Coulee which handle 1350 cfs (605,000 gpm) against 310 ft total head and are driven by 65,000 hp motors. Insofar as pressures are concerned, centrifugal pumps may range from the single stage cellar drainer which develops 10 to 15 ft to the multistage pumps presently under construction to serve as boiler feed pumps for the first super-pressure power plant and which will develop 5500 psi discharge pressure.

A centrifugal pump is basically a machine which consists of a set of vanes rotating within a casing. These vanes impart energy to the fluid by means of centrifugal force. Therefore, if we neglect such other refinements which may be added to either facilitate the maintenance or prolong the life of the main components, a centrifugal pump has a rotating element made up of an impeller mounted on a shaft and a stationary element made up of a casing, stuffing box and bearings. We shall discuss the structural details of these main elements and of the refinements applied to the construction of modern pumps in the articles of this series which are to follow. We should add that, while this discussion will attempt to cover all types of centrifugal pumps intended for all possible applications, it is natural that greater attention shall be directed at the types most commonly used in heating and ventilating and in the building industry.

Types of Centrifugal Pumps

Modern centrifugal pumps can be divided into various types. The basic subdivision concerns the impeller itself, specifically with regards to the direction of flow in the impeller. Thus, centrifugal pumps may have (1) Radial flow impellers, (2) Axial flow impellers or (3) Mixed flow impellers, which are a combination of the first two named. Insofar as these impellers are concerned, they may further be (1) Enclosed (with shrouds or side walls enclosing the vanes), (2) Open (with no shrouds), or (3) Semi-enclosed. Another subdivision of type concerns the question of water supply to the impellers. Thus impellers may be (1) Double suction, with water flowing to the impeller symmetrically from both sides or (2) Single suction, or impellers with a single inlet on one side. Subdivision of centrifugal pumps on the basis of the casing type yields two major groups: (1) Volute casing pumps. (2) Turbine—or diffuser—type pumps. In either case the pump casing may be split axially or radially.

A pump in which the total head is developed by a single impeller is termed a "single stage" pump. If the total head required is too high to be generated by a single impeller within practical limitations, two or more impellers (or pumps) may be used in series, the second impeller taking its suction from the discharge of the first impeller, etc. If all these impellers acting in series are located within a single casing, the centrifugal pump so constructed is termed a multi-stage pump.

Centrifugal pumps may be either horizontal or vertical

Igor J. Karassik is manager of the Multistage Pump Section, Centrifugal Pump Division, Worthington Corp., Harrison, N. J. Born in Russia, he emigrated to Turkey in 1919 then to Paris in 1924, where he graduated from high school. Coming to the United States in 1928, he received his B.S. and M.S. degrees from Carnegie Institute of Technology. He was employed by Worthington in 1934, as assistant to the consulting engineer on centrifugal pumps and was engaged in research and design work on single and multistage pumps. Since 1936 he has specialized in the application of multistage high pressure pumps, especially for power stations. His work has also included development and design of improved boiler feed cycles for central station power plants, a field in which he holds several patents. He has written numerous articles on centrifugal pumps for technical publications, many of which have been translated into other languages. In 1940, 1942 and again in 1944 he received the first prize in the Hydraulic Institute Engineering Essay Contest.

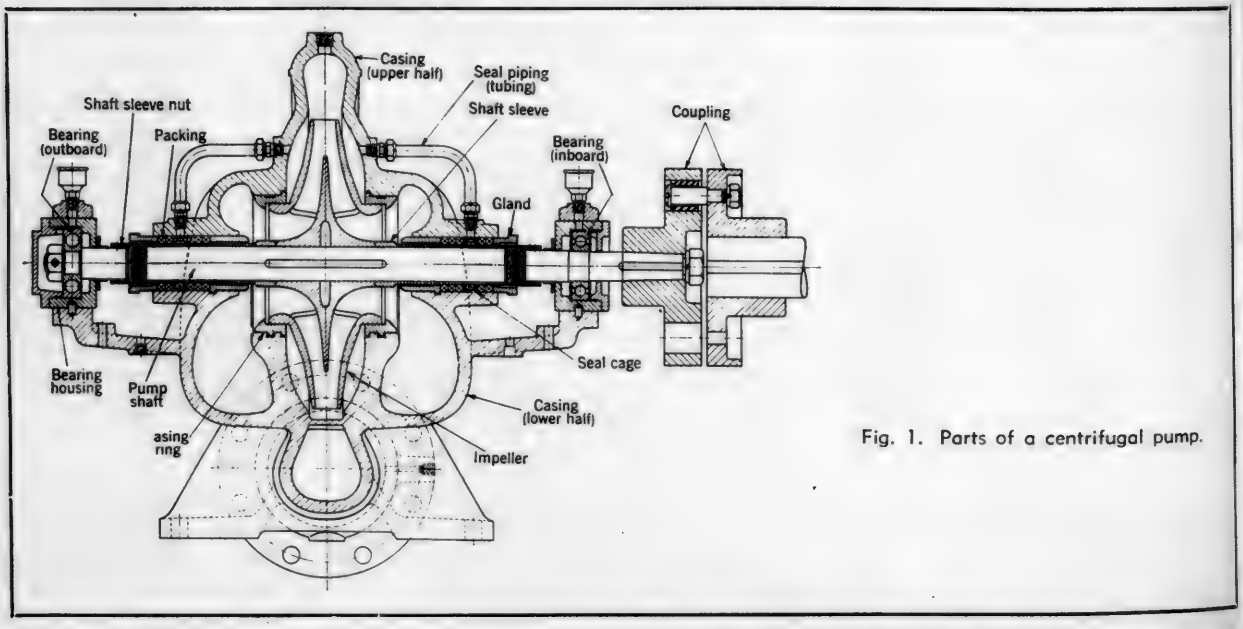


Fig. 1. Parts of a centrifugal pump.

Roy Carter is manager of the Volute Pump Section, Centrifugal Pump Division. He was born in Scranton, Pa., and completed his secondary education there. He attended Columbia College and the School of Engineering of Columbia University receiving A.B. and M.E. degrees. He entered the employ of Worthington in 1923 and after a training period in the shop was assigned to engineering work on centrifugal pumps. During one period he was responsible for approval of the hydraulic performance tests on centrifugal pumps. Being interested in the application of centrifugal pumps he gradually became more and more involved in the selection of centrifugal pumps for industrial water supply and processes and for municipal and federal applications, one field of which was turbo-centrifugal pumping units. This work has given him a broad experience in all phases of pumping problems as well as experience on all forms of drives for centrifugal pumps. His first article on centrifugal pumps was published in 1929 and has since been followed by many others.

in reference to the axis of rotation of the shaft. In some specific applications, the axis of rotation may even be inclined to the horizontal—as in the case of dewatering pumps in inclined mine shafts.

Horizontal shaft centrifugal pumps are also classified with respect to the location of the suction nozzle, and may be: (1) End suction, (2) Side suction, (3) Bottom suction or (4) Top suction.

Modern Trend in Small and Medium Capacity Range

One interesting trend in the small and medium size centrifugal pump field has been an extensive standardization of so-called production lines. This trend is prompted by the fact that about 60% of all pumps used in industry are centrifugal pumps and over 75% of all centrifugal pumps are in the range of heads and capacities which can be met by a line of standardized end-suction pumps.

A typical example of this trend to standardization is a line of pumps which consists of a number of liquid ends, all suitable for mounting on a motor for close-coupled connection, on a bearing frame for coupled or belt drive or on a close-coupled turbine. A large number of standard modifications are then incorporated into the basic plan—both from the point of view of materials selection and mechanical construction—so that "special" units are eliminated. The use of such an integrated line can lead to better delivery service, gives a wider selection of standardized units and can result in savings to the user through the maximum use of interchangeable parts. In one typical case, some 100 sizes of pumps, using interchangeable parts, can produce over 60,000 different, yet standard, combinations to suit almost any user's needs.

Some General Considerations

In the next article, we shall consider in some detail the structural features of centrifugal pump casings. But before entering into a discussion of the individual parts of centrifugal pumps, it may be advisable to look into a phase which, until recently, has been of a somewhat controversial nature: the selection of pump operating speeds.

For each and every set of conditions of service, there is a definite operating speed which will best approach hydraulic perfection. However, it is necessary to take into consideration the fact that most centrifugal pumps are motor driven. This dictates a choice to be made between speeds which correspond to the synchronous motor speeds at 60 cycles, and that 3600, 1800, 1200, 900 rpm, etc. From the point of view of cost, the higher the operating speed, the smaller the centrifugal pump and the less expensive. Therefore, the tendency is to always select the highest speed which can be used, as long as the application conditions permit this choice.

In the range of capacities most commonly encountered, that is up to 800 to 1000 gpm, 3600 rpm pumps will generally prove to be suitable for the service and therefore to be the preferred choice. As a matter of fact, most standard lines of pump manufacturers in this range of conditions are based on 3600 rpm operation.

In order to dispel the misconception—more prevalent in the past and almost non-existent today—that higher operating speeds may be less reliable, we should consider that it is not the number of revolutions per minute which affects the life of any given pump part. Instead, the deciding factor in determining the rate of wear is the linear speed in feet per minute, that is the peripheral or rubbing speed of that part.

Since the head generated by an impeller varies both as the square of its diameter and of its rotative speed, it is obvious that whether a 7-inch impeller rotates at 3510 rpm or a 14-inch impeller at 1755 rpm, the peripheral speed will be 107 fps in both cases and the head which they will produce will likewise be the same.

A similar comparison can be made with respect to the rubbing speed in the stuffing box, as an example. For a given shaft horsepower and a fixed maximum shaft, stress, the shaft of a 3600 rpm pump can be made smaller than that of the 1800 rpm pump. The shorter shaft span and the lighter weight of the 3600 rpm motor also help to reduce the shaft diameter without increasing the shaft

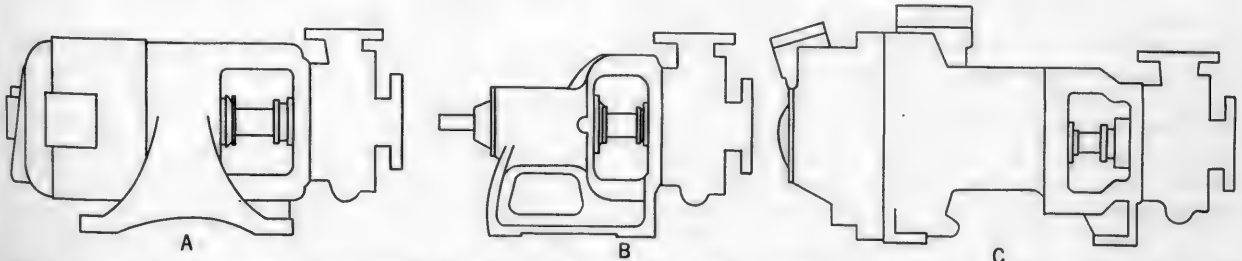


Fig. 2. Typical interchangeable standardized line of single end suction type centrifugal pumps. (a) Liquid end mounted close-coupled on motor. (b) Same liquid end mounted on bearing frame. (c) Same liquid end mounted close-coupled on steam turbine.

deflection. As a result, the average rubbing speeds of 3600 rpm pumps are scarcely greater than those of lower speed units.

Relative noise level is another important consideration in the selection of centrifugal pumping equipment in the heating and ventilating field. A complete discussion of this subject would be beyond the scope of this group of articles. It might, however, be interesting to list a few considerations which would serve to clarify our understanding of the sources of noise and the means used to keep pump noise to a minimum.

(1) Hyraulic noise can be due to poor matching of the pump to the conditions of service. If the conditions are best met at a speed of 3600 rpm, there will be less hydraulic noise at that speed than at 1800 rpm. The converse, of course, is also true.

(2) Hydraulic noises can likewise be the result of abnormal operation or incorrect application, since they come from:

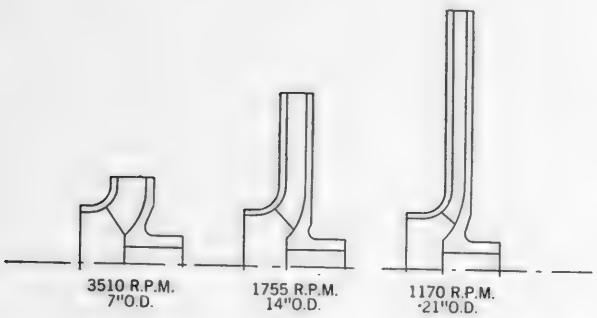


Fig. 3. Comparison of impellers designed for 540 gpm and 156 ft T.D.H. but operating at different speeds.

(a) Churning, (operation at too little or no flow).
(b) Instability, (operation at too much capacity or too low a head).
(c) Cavitation, (operation with too low a net positive suction head).
(d) Air in-leakage into the system.

(3) Extremely high fluid velocities in pipes rigidly tied to building structures can produce a noise that may be unjustly attributed to the pump. Care should be exercised in the sizing of piping to give reasonably low velocities as well as adequate support.

(4) Motor noises come principally from the fan and the bearings. Fan noise can be reduced to a remarkable degree by the proper design and location of the fan. For instance, where a large fan may have been used to provide more air movement through the motor, it has been frequently found that a smaller fan with a change in baffling will provide satisfactory cooling and lower the noise level appreciably. While bearing whirr is slightly more noticeable at higher speeds than at lower, proper bearing design can make this difference negligible.

(5) Noise can originate from vibration of a pump or its driver. A well designed unit, with proper alignment, will produce very little if any vibration.

(6) Precautions should always be taken to limit transmission of noise by providing insulated mounting and insulation of the piping attachments.

(7) A pump need not be quiet but only less noisy than the surrounding noise level. Usually, a sound level of a 80 to 85 decibels will be acceptable if precautions are taken to limit noise transmission and if the unit is not located at a place where people congregate.

Next month the authors will discuss the role of the centrifugal pump casing in pump performance and design.

Fluid Flow Studied in Clear Plastic Models

A novel and economical method for producing transparent models for use in study of fluid flow as a part of a foundry research program was reported here today by three metallurgists from General Motors Research Laboratories.

The development makes possible economical production of a transparent model of an investment mold containing irregularly shaped internal cavities such as are used in casting buckets for jet turbine type engines.

In a paper before the American Foundrymen's Society, D. G. McCullough, F. J. Webbere and Dr. R. F. Thomson reported how these plastic models were used to improve quality and reduce scrap of castings produced by the investment process.

In the new method a pattern for the required part is made of an alloy with a melting point so low that it would melt in a cup of hot coffee. A liquid, cold-pouring, thermosetting plastic is then poured around the metal pattern.

When the plastic has set, it is heated until the metal pattern melts and drains out. After the last traces of metal are cleaned out with acids, the mold is transparent and ready for use in flow studies.

The value of this development lies principally in its economy. Parts such as turbine buckets have irregular shapes and thin cross-sections, which make the machining of plastic mold models quite difficult, if not impossible. Casting the plastic around such parts is a relatively simple process that eliminates the need for machining.

Transparent mold models are used in the examination of fluid flow for the study of gating systems. High speed motion picture cameras capable of slowing the action down to one-sixteenth of normal speed are used to photograph the action of water as it flows through the mold in a simulated casting operation.

The high speed pictures disclose such things as turbulence in the fluid, entrapped air and uneven distribution of fluid in poorly designed mold arrangements.

The project was initiated in an attempt to produce cast test bars of uniform quality for the development of GMR-235—a high-temperature jet engine alloy invented by GM Research Laboratories.

Fig. 1. Photograph of the model of the building now being erected in New York City at the corner of Fifth Avenue and 43rd Street. Outside walls consist of glass and polished aluminum.

Air Conditioning and Heating a Glass-enclosed Bank Building

V. A. BIANCULLI

Associate of Syska & Hennessy, Consulting Engineers, New York, N. Y.

A glass-enclosed building introduces new problems in the design of air conditioning and heating systems because the interior is visible from the outside. What was done in the design of such systems for a new bank building now being completed, is related by one of the engineers on this project.

THE new architectural design of Manufacturers Trust Company's new branch at Fifth Avenue and 43rd Street, New York City, literally puts Banking on Display because of the extensive use of glass. The architects replaced the conventional design of granite and marble monumental exterior, with the largest sheets of glass ever installed in a building. The vault which normally is located in bank basements is prominently displayed on the first floor and can be seen by Fifth Avenue passersby.

The 125 ft x 100 ft building to be completed early this Fall, has two huge open banking floors, two office floors and an executive floor. The glass exterior is made of clear sheets up to 9 ft x 22 ft and ½ inch thick. Heat absorbing glass of this size is unobtainable. Glare is reduced by means of transparent drapes.

The building is completely air conditioned and its design is completely in keeping with the structure. All the ductwork, heating and plumbing piping are located in a hollow wall running the entire length of the building.

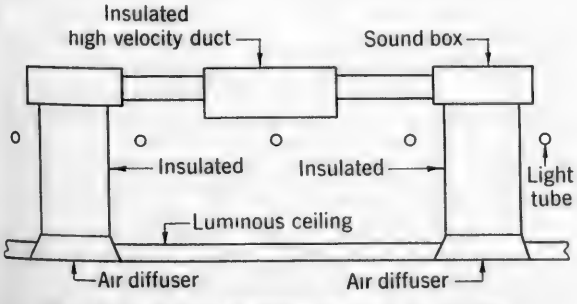


Fig. 2. Sound box between duct and air diffuser.

Air Conditioning

The air distribution system is split into five systems, a high velocity modified dual duct system handling the first to fourth floor east exterior zone. Two low velocity conventional systems handling the first to fourth floor interior and north zones, a low velocity dual duct system for the executive floor, and a low velocity system for the cellar lunch room.

The high velocity system for the east zone consists of dual duct risers located in a hollow wall. Automatic dampers located in each of the risers in this wall feed a single high velocity duct takeoff at each of the first four floors. The ceilings of the four floors are of the luminous type with the high velocity duct running parallel with the cold cathode lighting tubes. The entire ceiling of the two banking floors and portions of the third and fourth floors are made up of 9-inch strips on approximately 9½ ft centers with corrugated translucent plastic between each strip. The air diffusers are integrated into the 9-inch wide aluminum strips running perpendicular to the ducts.

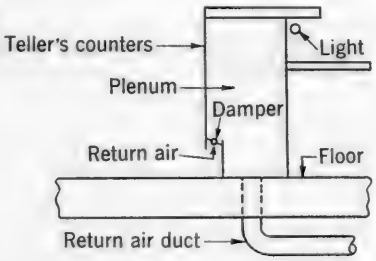
V. A. Bianculli, a native of New York City, received his B.S. in M.E. from New York University in 1935. In 1936 he started in heating, ventilating and air conditioning work with S. A. S. Paterno. He joined Carrier Corp. as a sales engineer in 1937. From 1939, through the war years, he worked with the U. S. Navy on heating, ventilating and air conditioning warships. Since 1945, he has been with Syska & Hennessy, Inc., consulting engineers, and is now an associate of that company. He is a licensed professional engineer in New York and Pennsylvania, and a member of the New York Society of Professional Engineers.

The noise due to the high velocity air in the ducts is reduced by means of a sound box between the duct and each diffuser as shown in Fig. 2. Thermostats located on each floor operate the mixing dampers to maintain zone temperature.

Air Distribution

The interior areas are conditioned by means of low velocity air distribution systems with the matching diffusers located in the 9-inch strips. As the north exterior zone is a continuation of the interior zone, electric reheaters are installed in the ducts to maintain zone temperature.

Fig. 3. Detail of bank counter which serves as a plenum chamber.



Air from the banking floors is returned to the fan room by means of recessed slots located in the Teller's counters. The counters, Fig. 3, act as return air plenums.

The second or mezzanine floor, is set back approximately 8 ft from the exterior walls. A continuous straight line diffuser is set in the face of the mezzanine floor which supplies air to the first floor east zone as shown in Fig. 4.

Vault and Executive Floor

The vault, located on the first floor is ventilated by means of a return air duct system in the vault ceiling. Supply air is drawn through the vault doors from the banking space. A special vault door is used to allow the air to return to the return air fan installed in the basement. This door is closed when the vault is closed for the night.

The executive floor is conditioned by means of a separate dual duct system on this floor. Each room has its own thermostats which operate dampers in the hot and cold air supply ducts. The ductwork is run in a monitor above the corridor in order to maintain ceiling height. Doors in the 3½ ft high monitor permit servicing of the damper motors. Special straight line diffusers, running the length of the walls, are used for supply and return air for conditioning the rooms. The diffusers are approximately 6 inches high and supply air at about 30 degrees below room temperature.

Refrigeration Plant

The refrigeration plant is located in the basement and provides 40F chilled water to the five air conditioning systems. The plant consists of two electrically driven reciprocating compressors having a total refrigerating capacity of approximately 280 tons. There were two reasons for selecting electric drive instead of steam drive for the refrigeration plant: (1) the architectural requirement for reducing the cooling tower size to an absolute minimum and (2) keeping the temperature rise in the condenser water system as low as possible to minimize fogging of the tower discharge air.

Chilled water is circulated through the cooling coils by means of two 15 hp pumps each delivering 330 gpm. There are two 15 hp pumps, each circulating 420 gpm of water through the refrigeration condensers.

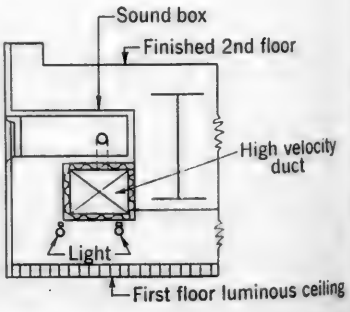
Heating Systems

Steam is supplied to the building from the New York Steam Corp., street steam main at a pressure of approximately 140 psi. It is reduced to 45 psi and 5 psi and then distributed to the equipment in the machine rooms. Steam at 45 psi is delivered to the domestic hot water heater, unit heaters, and the converters for the hot water heating systems. Steam at 5 psi is delivered to the heating coils.

There are two forced hot water reverse return heating systems for the building. One system handles the first through fourth floors, and the other the executive floor. The piping for the first through fourth floor system is run above the luminous ceiling and because of space conditions is run through holes in the beams and girders. The piping for the executive floor system is run in the floor slab. As the exterior glass for the third floor and above runs from the floor to the ceiling, it was necessary to partially recess the fin type radiators in the floor. See Fig. 5. The fins are 4¼ x 4¼ inches and the pipe has 40 fins per foot. Control for both hot water heating systems is by means of outdoor thermostats controlling the steam to the converters. A spare pump is furnished for each system in case of breakdown. Three tier high fin type radiators are used to heat the approximately 35 ft high glass exteriors between the first and third floors. Special spot lights are recessed into the radiator enclosures to light the circular vault door.

The vestibules are heated by a forced hot blast air heating system using the metal walls as plenums with

Fig. 4. Method of supplying air to the first floor east zone.



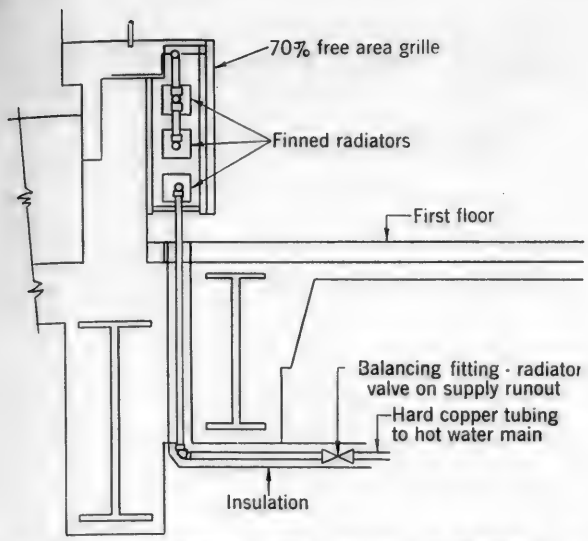

70% free area grille
Finned radiators
First floor
Balancing fitting - radiator valve on supply runout
Hard copper tubing to hot water main
Insulation

Fig. 5. Partially recessed finned radiators are served by hot water heating system through a steam converter.

a series of vertical slots close to the floor acting as the air discharge. Perforations in the ceiling of the bank lobby allow the air to return to the fan unit located in the basement.

Ventilation Systems

The greater portion of the basement, including the fan room, refrigeration machinery room and storage spaces, is ventilated by supplying part of the return air from the air conditioning systems. This was possible because the glass windows are sealed in place and there is no means for the ventilation air to escape except through the first floor lobby doors.

Credits

Architects for the building are Skidmore, Owings and Merrill; consulting engineers, Weiskopf & Pickworth; mechanical engineers, Syska & Hennessy; contractor, George A. Fuller Company, all of New York City.

Large Volume Fluid Metering Test Programs

Recent advances and developments in the techniques of orifice metering have created a need for more reliable data on the installation and use of this type of meter. To meet this need and to evaluate a number of uncertainties that have developed, a research project has been carried out jointly by the National Bureau of Standards, the American Gas Association, the American Society of Mechanical Engineers, and the Naval Boiler and Turbine Laboratory. Orifice meters are employed almost exclusively for the metering of natural gas between producing fields, pipe lines and distributors, thus measuring millions of dollars worth of gas a year. They are also widely used for metering other gases and liquids.

In 1935, the American Gas Association issued its "Gas Measurement Committee Report No. 2" giving basic information on the factors to be used and installation procedures to be followed in applying orifice meters to the metering of fuel gas in pipes from 2 to 14 inches in diameter. Two years later the American Society of Mechanical Engineers issued a fourth edition of "Fluid Meters: Their Theory and Application", a report by the Society's Research Committee on Fluid Meters. Almost immediately these reports became standard instruction manuals for the metering of both gas and liquids throughout this country and even to some extent abroad. Many purchase contracts for fuel gases stipulate that orifice meters are to be used in accordance with AGA Report No. 2.

Since these reports were issued, and especially in more recent years, numerous changes and developments have occurred in the art of metering fluids and gases. Thus, for example, the work on which the original Report No. 2 was based employed gate valves; today, however, the great majority of meter runs are equipped with plug valves of very different port shape. There is also a growing tendency to use orific fittings so that an orifice plate can be quickly changed without shut-down. Difficulty in obtaining pipe, particularly during World War II, resulted in meter runs being made with whatever material was available and with no consideration given to pipe roughness; effects of this roughness on meter accuracy are not known. Because of these changes and other developments, new editions of both the AGA and ASME reports are being prepared. The National Bureau of Standards is assisting in the preparation of these new editions, as it did with earlier reports.

Participation by NBS in this work began about 1920 when a chapter on the theory of the Venturi tube, the Pitot tube, and the orifice was prepared for the first edition of the ASME report on the theory and application of fluid meters. In 1922, the Bureau started a research program on orifice meters as a result of requests by the U. S. Bureau of Mines and the Indian Agency for authoritative information on such meters for metering natural fuel gases. Then, upon invitation, the Bureau took an active part in several programs, planned and carried out by committees of AGA, which supplemented and extended the scope of the Bureau's original program.

In 1931 the committee of the gas association invited the Research Committee on Fluid Meters of ASME to join in preparing a basic report on the use of orifice meters. The reports issued in 1935 and 1937 incorporated the results of this joint activity. Since the Bureau had been represented on the individual committees of the two associations its representative was selected as one of this joint group.

During the first 10 years following issuance of the latest reports, steady progress was made in the application of the factors and recommendations on installation given in these reports. As the use of these reports expanded, many questions arose regarding details of their use and even their applicability and accuracy. Many of these questions could be answered by the committees concerned, while a few were placed with a slowly growing list of topics to be considered as the objectives of possible future work.

Design Criteria for Industrial Heating and Ventilation

MARTIN A. O'NEILL

Project Engineer, Catalytic Construction Co., Philadelphia, Pa.

Not many years ago, it was the usual practice to have a heating and ventilating engineer do only that part of the design of a building that his title implied, and nothing more. Very little thought was given beforehand to any possible dust or fume control from the standpoint of health requirements. It was quite acceptable to place a hood, duct, and fan where conditions proved intolerable after the plant was in operation. It has been only in the past decade or so that real effort has been directed toward closely correlating dust and fume control design with heating and ventilating. At Catalytic Construction Company, responsibility for the combined design is vested in an industrial health group that includes specialists in heating, ventilating, air conditioning, dust and fume control, radioactivity, and related functions. The resultant design work, without duplication of effort, is well balanced and reflects economies in procurement, construction, and operation that only coordinated planning can produce.

AVAILABLE data and broad experience form the basis for heating and ventilating design. Criteria are: (1) Process and comfort requirement; (2) potential hazard to health; (3) climatic conditions; (4) requirements of codes and laws; and (5) generally accepted standards for cleanliness of air, both inside and outside the plant. The finished design must be in accordance with good engineering practice, utilizing, insofar as possible, equipment and standard design and reputable manufacture. It is often possible to use considerable ingenuity in solving difficult problems without resorting to costly specialized equipment peculiar to the installation at hand.

Building Design

The heating and ventilating engineer may be consulted in the establishment of the materials and construction of the industrial building. An economic study of estimated heat losses versus amortization costs of structure will indicate appropriate construction. Some of the points to be considered are indicated in the paragraphs which follow. They must be evaluated in regard to both winter heating requirements and summer comfort cooling. Process generation of heat plays no small part in these considerations. Abnormal requirements of local exhaust

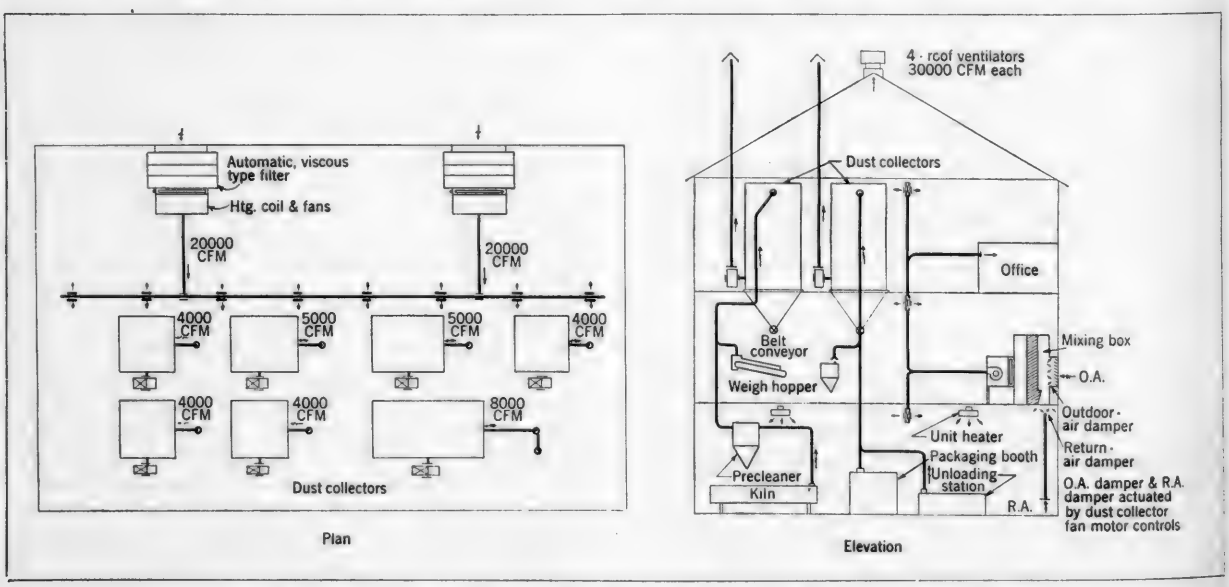


Fig. 1. Schematic diagram of an integrated industrial air handling system.

Martin A. O'Neill is a registered professional engineer in the State of Pennsylvania, whose experience in piping, structures, and heating, ventilation and dust control covers a period of thirty years. For three years he has been a project engineer with Catalytic Construction Company, and except for certain unit projects, has concentrated his efforts on heating, ventilation, dust control and radiation shielding in a variety of applications both for A. E. C. and private industry. Mr. O'Neill attended Duquesne University, following which he has participated in the design of gas mixing plants, coke and by-product gas plants, boiler plants and ore refineries. He is a member of the Philadelphia Section, American Industrial Hygiene Association, and this paper is adapted from a presentation before the annual Tri-State meeting of the Philadelphia, Northern New Jersey, and Metropolitan New York sections of the AIHA.

ventilation, and the necessity in winter for providing tempered make-up air, may make other heating aspects secondary, permitting light wall construction.

Climate. In mild climates, light wall construction, such as uninsulated corrugated iron or transite may be acceptable. In more severe climates, insulation, perhaps with masonry construction, may prove good economy.

Cost and Availability of Heat. Where an excessive amount of exhaust steam is available which would otherwise be wasted, heating economy may dictate light wall construction and more radiation.

Life Expectancy. For an anticipated usefulness of, say, eight years or less, or where expansion within that time is foreseen, insulation or masonry, especially on the side or sides where expansion may occur, may not be justified.

Nature and Requirements of Process. This is probably the biggest factor. A windowless, masonry or insulated structure may be indicated where air conditioning is required. Where high humidity is necessary insulation is almost invariably required. Light wall construction and plenty of pivoted windows may be used where there is excessive process heat.

Infiltration and Air Supply

Infiltration is ordinarily computed by the air-change method, or the crack method, as indicated in most handbooks. Of the two, the crack method is usually preferred. Infiltration in the average industrial building is considered sufficient for ordinary ventilation needs, with make-up air being supplied slightly in excess of the amount removed by local exhaust ventilation. A slight excess of make-up air aids in controlling and reducing drafts. This is the point where close coordination between process ventilation and heating and general ventilation is demanded.

Considerations of the number of air changes per hour should be tempered with judgment. In a large building, say 100 ft by 100 ft or more, the recommended number of air changes should be applied only to that volume of the building within say, 20 ft of the outside walls. The air change method is suggested as an over-all check on the values obtained by the crack method.

It is a common design error to arbitrarily provide heat for two or three changes per hour without making certain that amount of air will ever be introduced into the building. When such is the case, unnecessaarily costly oversize equipment may be called for.

Process sometimes requires that the building, or a portion of it, be slightly pressurized in order to eliminate any possibility of infiltration from surrounding areas. The crack infiltration then becomes outfiltration, and anti-backdraft louvers may be required.

Design Conditions

Outdoor design figures for temperature, humidity and wind conditions as published in standard references are acceptable. In general, the design temperature can be taken at 15 degrees F above the lowest recorded for the vicinity over a long period of time. The direction and average velocity of prevailing winds is a factor in determining infiltration, and it influences the outside film factor in determining the heat transfer coefficient. The orientation of the building must be considered in determining criteria for air conditioning design.

The process for which the building is being designed controls the inside design temperature. Two conditions must be investigated: (1) Temperature to be maintained during operation; and (2) temperature to be maintained during shut-down. Consideration of the first can be quite involved. Different portions of the building may require different standards. Process may demand a minimum or a maximum within close limits, perhaps with humidity control.

The absolute minimum requirement during shut-down is, of course, the prevention of freeze-up of facilities such as sprinkler systems and the like. If this minimum must be held, it is advisable to study the steam demand and length of time required to bring the area up to operating conditions. If the down-time is to be used for maintenance, then fairly comfortable working conditions should be provided. Not less than 45F is recommended. In unusual cases, the material being processed or stored, will determine the indoor design temperature. This is the absolute minimum for which heating equipment must be sized. Operations dictate the capacity that must be added. The heat given off by processes, motors, furnaces, the product, and other sources, added to this minimum requirement, must maintain the required temperature during operations. All make-up air, either for general or local exhaust ventilation, should be tempered.

Ventilation, Natural and Supplied

Ordinarily, in the average building for light industry, infiltration is sufficient for the "down-time", and quite often, crack infiltration in a building with a roof monitor or gravity roof ventilators is sufficient for winter operation, in which case, the heating problem is quite simple. When we go to forced ventilation, make-up air heating units and distribution ductwork are required.

Where a hazard could occur, such as an acid spill, the breaking of an ammonia line, and so on, emergency ventilation must be installed. Powered roof ventilators or wall fans, or a combination of both, with a capacity of 10 to 30 changes per hour, should be provided depending on the confining space and nature of the material. Careful consideration must be given the location of the controls in such an area. Manual controls should be located either outside, or in a place reachable from the outside. In some instances duplicate controls within the

space are advantageous. Emergency louvers to admit this air, normally closed, and mechanically operated, may be interlocked to open when the fan motors are energized. If manually controlled, they must be operable from outside the building. No consideration is given this emergency ventilation when determining heat requirements. For areas liable to contamination with carbon monoxide, acids, and flammable vapors, automatic ventilation activated by a continuously operating air sampler and sensing device may be used.

For summer ventilation, even with buildings of masonry or insulated construction, powered roof ventilators with a capacity of five or more changes per hour should be considered. An exception may be in the case of a building with a big percentage of pivoted sash. But it must be remembered that pivoted sash has a high rate of infiltration which is reflected in the heating load. For calculating summer air changes, a good starting point is to figure the amount of air change that will permit a maximum rise of five degrees indoor temperature over outdoor, based on process and sun loads.

General Ventilation via Local Exhaust

Up to this point, only general, and comfort, ventilation, have been discussed; that air which can be discharged to the outside without filtering. Local exhaust ventilation can be defined as that air used to control and collect dust and fumes from a specific area, and is usually filtered or scrubbed, either to collect the dust for salvage, or to control air pollution. It is seldom desirable to return this air to the room, even though it might represent a large part of the heating load. An exception might possibly be the discharge from electric precipitators or absolute filters on very light loads. Make-up air slightly greater in amount than that removed through the local exhaust system must be heated in winter and is usually distributed throughout the room by ductwork, with diffusing outlets. Where local exhaust ventilation is insufficient to meet general ventilation requirements, it must be supplemented.

Where make-up air is distributed through ductwork, the system can conveniently be employed to provide the total heating load of the building.

Equipment

In determining the type of equipment to use, consider first the condition where the amount of make-up air is large. Heating units, usually consisting of an intake louver, air filter, steam coils, and blower set, can be sized to carry all of the building heating load, and are especially recommended where 24-hour operation is planned. By means of a mixing box and damper set, room air may be recirculated, or 100 percent make-up air supplied. The damper operating mechanism may be interlocked with exhaust ventilation equipment so that energizing the exhaust ventilation motor will actuate the damper mechanism, opening the outside air intake damper and closing the recirculated air damper a predetermined amount. Such an arrangement affords maximum heating economy.

The air filter for small units may be throw-away or washable type, and for large units, a moving frame automatic oil cleaning type is advantageous. The filter keeps dirt out of the distribution system, and preserves the efficiency of the steam coils by preventing build-up of foreign matter, such as soot, dust, and insects, on the fins. In the oil type filter, the oil itself may be cleaned by pumping through a replaceable cartridge filter similar to the oil filter in an automobile. The heating coil should be of the non-freeze type, or protected by a thermal drain. The leaving air temperature may be controlled by a room thermostat operating a modulating steam valve.

Under some adverse conditions, as in areas where corrosive fumes may exist, no recirculation can be permitted.

For industrial installations, a maximum duct velocity of 2000 fpm is acceptable.. Diffusers and multi-louver registers should be adjustable both for balancing the system and controlling the direction of blow. Outlet velocities should be in accordance with manufacturers standards.

Where long shut-down periods are encountered, the minimum heat requirements may be met by auxiliary unit heaters, thus permitting the shut-down of the large heating unit fan motor.

Where little or no make-up air is required, the use of either finned pipe radiation with steel fins and expanded metal covers or unit heaters is indicated.

Dust Fume, Mist, Vapor Control

The ultimate has been achieved when, with the least volume of air, the atmospheric pollution level is held consistently within the maximum allowable concentration. Design criteria for the handling of this air can be established.

Each hood or enclosure presents its own problem as to shape and size, but generally the inlet velocities will range from 50 to 200 fpm. Recommended velocities are rather well established by such authorities as Dalla Valle, Brandt, Drinker, Hemeon, and Hatch. In determining the amount of air provided, the designer should take into consideration anticipated openings as well as existing openings. Anticipated openings are those that might arise as a result of poor maintenance, or future access or viewing ports.

Moving equipment such as weigh hoppers, covers for drums being filled, and the like, may be vented by an open ended vent, over which is a bell shaped hood connected to a dust collection branch. When a rigid connection is permissible, such as on a surge hopper, slotted holes may be made in the duct near the hopper, and a movable sleeve with matching holes provided. By the admission of room air in this manner, a carrying velocity in the duct with minimum draft applied to the vessel is provided, and the balancing of the system facilitated.

Duct velocities range from 3500 to 4500 fpm for dust handling. While this range may be somewhat higher than commonly recommended for some materials, it assures self cleaning and is not excessively high from the abrasion standpoint.

Branch and main volume balancing should be done by so adjusting volumes, friction losses, and velocity heads that the calculated total pressure characteristics at junction point of branch and mains are equalized. Dampering should also be provided at the inlet ducts and fan outlet so that unanticipated subsequent changes in demand can be accommodated.

HEATING AND VENTILATING

HEATING AND VENTILATING

The front cover of the first issue of "The Heating and Ventilating Magazine", and the cover of the 50th Anniversary issue.

THE first issue of The Heating and Ventilating Magazine was published in June, 1904; copies were distributed personally by H. A. Smith, then editor and publisher. The magazine at that time was 7 x 10 inches with 28 pages of editorial text and 20 pages of advertising, including the front cover which was divided among several advertisers. In 1905, A. S. Armagnac became editor, and in 1908 he and Gustave Petersen, who became business manager, purchased the magazine. Their partnership continued until 1928.

At the close of that year, the publication was sold to National Trade Journals which published sixteen other business magazines and which continued as publisher until 1931, at which time HEATING AND VENTILATING was sold to The Industrial Press, the present publisher.

In the meantime, on its 25th Anniversary in 1929, the name of the publication had been changed to its present form, and Messrs. Armagnac and Petersen had retired. Mr. Armagnac was succeeded in 1930 as editor by C.H.B. Hotchkiss who came to his new position from the faculty of Purdue University, and Mr. Petersen by Cliff W. Presdee, who continued in the position of business manager for several years. In 1940 Mr. Hotchkiss resigned to enter the export business and was succeeded by Clifford Strock, the present editor. Harold L. Gray is presently the publishing manager of the magazine, and the staff operates under the direction of R. B. Luchars, president, and E. A. Becker, vice-president of The Industrial Press, as has been the case since the change in ownership in 1931.

There are two active and prosperous offshoots of HEATING AND VENTILATING. In 1928, Messrs Armagnac and Petersen launched a monthly publication devoted to oil burners and known as Oil Heat, which was sold separately and later merged with Fuel Oil Journal to form the magazine now known as Fuel Oil & Oil Heat.

The second publication to be descended from HEATING AND VENTILATING is Heating & Plumbing Equipment News, whose first issue was in January, 1950, and which continues to be published by The Industrial Press as a publication whose primary aim is to serve the residential heating and plumbing contractor. It has a circulation of 35,000 and reached a new high in advertising volume in last month's issue.

In contrast, HEATING AND VENTILATING is primarily concerned with the design, installation and operation of the mechanical equipment—heating, ventilating, air con-

Completes Fifty Years

ditioning, piping and plumbing—of the larger buildings, particularly those with engineered systems. Its present circulation is approximately 15,000.

Fifty Years Ago

Fifty years ago, when HEATING AND VENTILATING began publication, Theodore Roosevelt was president of the United States and newspapers were concerned with the activities of "malefactors of great wealth." Labor was becoming vociferous in demands for higher pay, and steamfitters in New York were getting $27.00 for a 48-hour week.

In the field served by the magazine, readers were concerned with vacuum steam heating and the royalties being paid on the patents for such systems. School heating and ventilating, which continues to this day as a "hot" subject, was the lead-off article in the first issue. A chart for solving greenhouse heating problems was also presented, as was a review of the indoor humidity question written by a doctor of medicine. The editor commented on the newly-enacted New York State law relating to school ventilation and calling for 30 cfm of "pure" air per pupil. The new equipment described in the same issue described a new cast iron boiler and an ornate cast iron wall radiator.

The seventh semi-annual meeting of the American Society of Heating & Ventilating Engineers was announced as to be at the Cadillac Hotel in Detroit where the members got a special rate of $3 per day on the American plan, $2 on the European plan.

In the July issue appeared a letter from a reader asking if he could determine the surface of a radiator by immersion, one from a reader with a problem of drying feathers, and a third from "Perplexed Heating Contractor" who got poor agreement in calculating heat loss by three different methods. A new indirect heater was announced, and the editor reported that the closed shop was doomed. In the report of the ASHVE summer meeting, the editor included a note that the New York members on their return suffered from the heat and dirt, even though the trip was on Phoebe Snow's "road of anthracite."

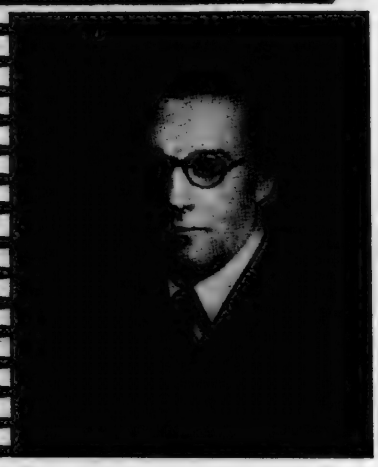
The third issue had a lot to say about ventilation, and oil burning was discussed in a later issue. The 1907 issues contained two articles on air conditioning, one by Willis H. Carrier on textile mills, in which he stressed the importance of internal heat gain and tabulated data on the cooling effect of evaporation. The second described the cooling of the Scranton High School auditorium by ice for the graduation ceremonies; nearly 20 tons of ice were used in three evenings, but the room was cooled from 90 degrees to 70 degrees, and the humidity was well below saturation, the moisture being controlled by use of calcium chloride.

During the early days of the magazine, the industry was preoccupied with problems generally different from those of concern today. The ratings of boilers, for example, were controversial over a long period of years, but this question was finally resolved by more conservative methods of rating, notably those of I-B-R and S.H.B.I. The subject of boiler ratings received much attention in the first 25 years of the magazine's history, virtually none during the past 25 years.

Trends Over the Years

Curiously, perhaps, this division into two distinct periods of 25 years each applies to many other equipments. Steam heating underwent a great change during the period 1904-29, but relatively little since. Hot water heating, which had remained virtually unchanged from 1904 to 1929, circulation being by gravity, became far more important when a pump was applied, and the development of today's forced hot water systems is largely one of the 1929-1954 era. A somewhat similar situation exists with warm air heating; great improvements were made in the earlier period, the standard code being adopted by the National Warm Air Heating Association during those years as the result of research at the University of Illinois. The subsequent period of 1929-54 saw the forced warm air system widely adopted. Today there is virtually no gravity water heating being installed, and forced air heating has to a great extent pushed out gravity systems.

Another great development during the second twenty-five years of the life of this magazine has been that of automatic heating with oil and gas. Although oil burning had developed importantly by 1929, the really great strides are those made in subsequent years, and the latter statement also applies to gas heating. A corollary development was that of controls; although they were firmly entrenched by 1929, their use at that time was small as compared to today.



Top: A. S. Armagnac, Editor, 1905-1928. Above: Gustave Petersen, Business Manager, 1908-1928.

As mentioned earlier, Mr. Carrier was writing about air conditioning in 1907, but it was not till years later that the term became familiar. By 1929, Carrier and his company were well known through the world, but most applications were in industrial buildings and theaters. During the second period (1929-54), air conditioning made great strides in a wide variety of applications, culminating in the opening up about 1950 of the vast and long looked for residential cooling market. This new market, first attracted to air conditioning via the room cooler, has now partially moved into the central system phase.

In short, looking back from 1954, the period from 1904 to 1929 appears to have been one of great innovations and pioneering of basic ideas, with the subsequent 25-year period from 1929 to now being one of obtaining wide acceptance for the ideas, as well as great improvement in the original ideas. This is true of such equipments and materials as air cleaning devices, the unit heater, the convector, radiant or panel heating, unit ventilators, building insulation, copper tubing, alloy pipe, boiler safety devices, underground conduit, refrigerating compressors, finned heat transfer surface, axial flow fans and many others.

On the other hand, some developments seem to belong primarily if not wholly to the second or 1929-54 period. The modern air diffuser is one example, the packaged steam boiler is a second; among others, perhaps, would be the welded fitting, plastic pipe, hot water baseboard radiator heating, and the heat pump.

Importance of Research

There seems to be little doubt that research has played a dominant part in bringing to fruition the inventions and basic ideas. Research in this field is going on everywhere. Outstanding, of course, is the work of the ASHVE Research Laboratory which, since its inception in the early twenties, has produced information of inestimable value and at an ever-increasing rate.

In addition, the research at the country's universities has been of great importance, starting with that on warm air heating at University of Illinois. Some carry on cooperative research with ASHVE, while others work independently. Their combined efforts over a period of years have resulted in enormous good.

Other research is carried on by governmental agencies, utility companies, trade associations, and others. Finally, and increasing from year to year, is that done by individual manufacturers. The cumulative effect of all this research to the industry cannot be calculated.

A highly important factor in the progress of the art is the awareness of Americans to automatic heating, good ventilation, and air conditioning. Far more attention is given today by a home builder to heating than was the case years ago; the investment of air conditioning in an office building today is more than double in per cent of total project cost what it was only a few years past.

The Future

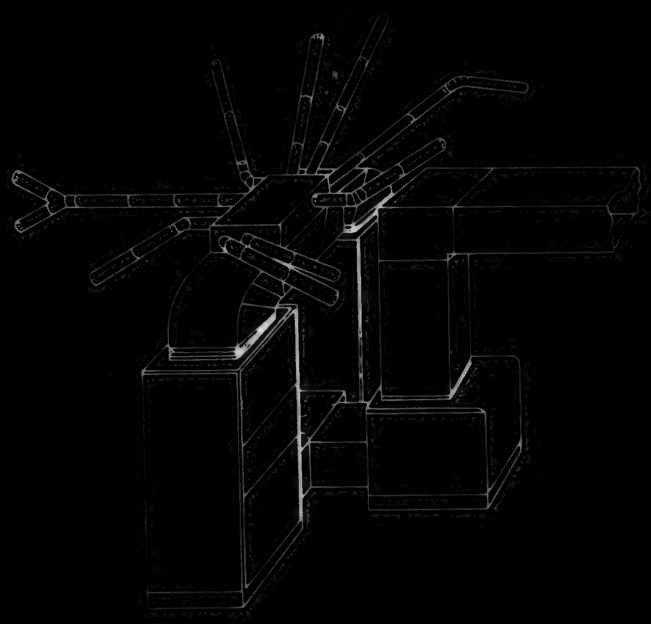
Predictions as to the future of an industry more often than not appear ridiculous in later years, and no attempt will be made in this brief resume to forecast. However, even the most pessimistic observer would, we believe, agree that the next 50 years will see great changes, great improvements for this industry, perhaps even to a fantastic degree. We may be on the edge of a period which will see great development in use of solar energy and atomic energy; electric heating holds possibilities; electronic air conditioning has been mentioned as being within reasonable distance; we are probably going to be forced to clean up the outdoor air in cities.

Whatever the developments of the future, HEATING AND VENTILATING will, as always, strive to provide its readers with information on the best current practice written by top men in the field. It will continue to report the significant news and trends in the industry in concise, immediately usable form, furnishing authoritative and dependable information on the latest engineering practices, design trends, improved equipment, and new materials.

And in all things it will continue to stress the practical approach, so that its readers—the busy designing and installing engineers—will have the engineering facts they need and use in their work.

How to Convert Residential Warm Air Systems to

YEAR-ROUND AIR CONDITIONING



Walter R. Yeary

Air Conditioning Division, Westinghouse Electric Corp.,
Hyde Park, Mass.

HEATING AND VENTILATING'S REFERENCE SECTION

How to convert residential warm air systems to

Year-round Air Conditioning

WALTER R. YEARY

Air Conditioning Division, Westinghouse Electric Corp., Hyde Park, Mass.

Many residential heating systems will be converted to year-round air conditioning. To meet this growing trend, information is supplied to help the contractor secure such conversion business. Engineering data are presented as a guide for system design.

Walter R. Yeary, headquarters application engineer for self-contained air conditioning products, has been with Westinghouse Electric Corporation at Hyde Park, Mass., since September, 1952. Following three years' service as an officer in the Signal Corps, he was a field engineer for the Air Conditioning Division of General Electric Company and in 1947 became service manager for a major G-E distributor. In 1950, he joined Westinghouse as an air conditioning application engineer and was placed in charge of the Washington, D. C., field office. Two years later he was transferred to Hyde Park. He will be supervisor of training at the new Air Conditioning Division plant and headquarters at Staunton, Va., and will handle the training of division field men, and wholesaler-distributor-dealer personnel.

A FEW years ago, domestic heating installation was almost a seasonal occupation, and residential summer air conditioning was unknown. Heating contractors did most of their work during the warm months when no one would suffer from lack of heat. The advent of the modern packaged heating plant was highly instrumental in changing this situation so that a very high percentage of heating contractors now devote full time to replacements and conversions.

The replacement and conversion of old gravity furnaces, floor furnaces, and aging or worn out forced air plants is a large and profitable field. The whole business is undergoing a great change.

Many thousands of the existing 15 million domestic warm air systems will be converted to year-round heating and cooling within a few years. Thus, a great, new and profitable industry opens up to those prepared.

The variey of residential cooling and heating apparatus now available offers a choice of many different types of central plant systems. There are heat pumps, combination heating-cooling units, single cycle cooling units, and all sorts of heating plants listed among the self-contained packaged apparatus designed for central application. To these may be added the window units, console floor units, and field assembled central plant apparatus. There is now a great demand for any type of residential year-round air conditioning with the self-contained central plant types leading the field.

Year-Round Air Conditioning

Contractor Requirements. Most states have some type of licensing procedure for air conditioning contractors. For the best answer to this question you should consult the Board of Heating and Air Conditioning Contractors or Examiners (or some similar body) connected with your state government. Some cities also have rules, regulations and ordinances controlling contracting and installation practice and it is also wise to determine the extent of such controls prior to contracting for jobs.

Personnel. Employment of a capable air conditioning sales and application engineer, or training the most promising member of your present staff, is the first and most important step to be taken as far as personnel is concerned. If you now employ a capable heating engineer, this article is designed to give him a working knowledge of the fundamentals of residential air conditioning application engineering. The practice of converting existing systems to year-round operation is discussed for the benefit of all concerned. From this point on, practice is the forerunner of efficiency.

Additional personnel for installation work normally consists of tinsmith, electrican, plumber, carpenter, and a good refrigeration man. The installation foreman or supervisor may be developed from the refrigeration technician and given the responsibility of handling cooling equipment installations, or the heating installation foreman may handle both heating and cooling, if technically qualified.

Some contractors prefer to sub-let ductwork, plumbing, carpenter work and electrical work. This method is satisfactory if reliable sub-contractors are available. However, every contractor should aim toward doing as many of these jobs as possible and thus eliminate split responsibility for various phases of the work.

A good, capable refrigeration service man is a necessity. In small establishments, he may double in trade as an oil burner mechanic or some other job. It is not always good practice to assign the task of service to the installation supervisor unless your organization is a small one doing a small amount of air conditioning work.

Working Equipment. This category may include all plumbing, electrical, and refrigeration tools and sheet metal shop. The latter is a necessity if you plan to do your own duct work and expand activities to a full fledged heating and air conditioning contractor. On the average, the warm air contractor doing a reasonable and profitable amount of work has the necessary equipment to handle residential air conditioning.

SURVEY

Date .....

Job Name ..... Survey No. ..... Job No. .....
Location .....

1. Type of work to be done: Heating ..... Cooling ..... Both .....
   New ..... Existing Equipment ..... Conversion ..... Addition .....
   Explain: .....
2. Direction building faces ..... Direction prevailing winds ..... What walls are shaded? .....
3. Areas to be (heated) (cooled) .....
   ..... (Sketch floor plan on reverse side and show all dimensions)
4. Design conditions: Summer ..... °F DB outdoor, ... °F WB outdoor; ..... °F DB indoor,
   ..... °F WB indoor. Winter: ..... °F outdoor, ... °F indoor.
   Temperature difference: Winter ..... Summer .....
5. Is humidifying or dehumidifying required? ..... Is either presently used? .....
6. Wall construction and color .....
7. Roof construction .....
8. Ceiling construction .....
9. Floor construction .....
10. Partitions construction (only those adjacent to unconditioned space) .....
11. General overall construction: Tight ..... Loose ..... Average .....
12. No. of people in normal occupancy ..... Avg. No. at parties ..... Pty. frequency .....
13. Appliances in conditioned space: Washer ..... Dryer ..... Ironer ..... Dish washer .....
    Range ..... Hot water heater ..... Furnace ..... Other .....
14. Is kitchen or bathroom mechanically ventilated? ..... CFM rate in each .....
    If not ventilated, is it required with this job? ..... Which ..... CFM .....
15. No. of children in family .....
16. Insert the following information for room numbers:

Item	1	2	3	4	5	6	7	8	Totals
Dimensions									
Cubic volume									
Lights, watts									
Appliances, watts									
No. of people									
No. of windows and area									
Type of glazing									
Supply registers and size									
Adjustable or non-adjustable									
Return grilles and size									

17. Insulation type and thickness: Roof ..... Ceiling ..... Walls ..... Floor .....
18. Type of condenser to be used ..... If water cooled: Source of water .....
    ..... Temperature ..... Adequate supply? .....
    Water cooling tower? ..... (On reverse side show location of water cooled or air cooled condenser.)
19. Size of access door to conditioner or furnace location .....
20. Existing duct size: Main supply duct at plenum ..... Return duct at plenum .....
    Length and size of longest run ..... Is duct insulated? .....
21. Existing furnace: Output Btu/hr ..... Fan size ..... Fan CFM ..... Fan motor HP .....
    Gravity circulation? ..... Grille size ..... How fired? Gas ..... Oil ..... Coal .....
22. Electrical: Existing power facilities ..... Volts, ... Cycle, ... Phase .....
    Is existing wiring ample to handle load? ..... Will new wiring be required? .....
23. Make sketch of duct system on floor plan on reverse side .....
24. Other useful information: .....
    .....
    .....
    .....

Fig. 1. Suggested form for use in making a survey.

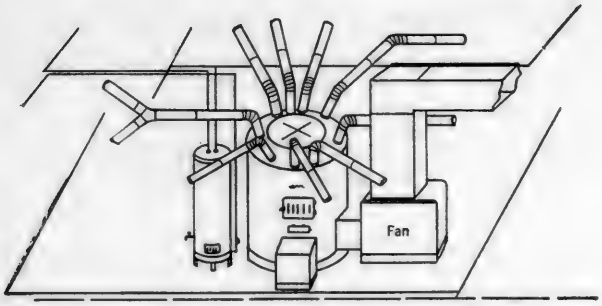


Fig. 2. Method for converting old gravity type furnace.

How to Make a Survey

When a prospect expresses a genuine interest in having his present heating system converted to year-round air conditioning, a survey must be made before the sale can be consummated and the actual installation started. It is very important to every phase of the entire installation. See Fig. 1.

The survey should tell whether or not the contemplated conversion is practicable from the standpoint of installation, customer cost, and satisfactory performance. It should determine whether or not the existing system is one which can be converted; if a new system is in order; or if the entire matter should be forgotten. You will probably find a few homes with old gravity type systems which will be too costly to convert. These old homes will require a complete new duct system and such work requires much cutting and patching over the house with the possibility of duct runs being exposed in some rooms. The owner may object to the expense, the cutting and patching, and the exposed duct work.

To begin the survey, you should have a pad of grid paper for sketching the location of furnace, ducts, grilles and registers. Note on the sketch the size of the furnace, ducts and registers, fan, fan motor and other details of importance; also type of electrical service and its location, size of water pipe between the house and the street, size and location of nearest drain, height of basement from floor to underside of floor joists, available space (unused) around the furnace, direction and size of supply trunk duct, direction and size of return trunk duct, and whether or not ducts are insulated.

The dimensions of the entire duct system should be noted, if possible (see Existing Duct Systems), and also from this determine the branch duct with the highest friction loss. This information will be used later in fan calculations. The cubic feet per minute of air circulated by the existing fan may be determined by consulting the specifications of the furnace being examined.

Next make a sketch of the entire house and note the dimensions, construction of the walls, thickness of insulation in walls or ceiling, height of ceiling, type of roof (flat or gable), number and size of doors and windows, direction which the house faces (East, South, North or West), type of window blinds in use, whether windows are single or double glass, the location of all halls, closets and utility room (good duct space in old homes), and other points which may help you make an efficient heat gain calculation and system layout.

Note the number of occupants, ask about excessive moisture load (cooking, home laundry), inquire about frequent parties and the average number in attendance, note the rooms or spaces which are not to be conditioned.

Note on the survey the number of small children in the home. You may need this information in calculating the infiltration rate. This normal infiltration is usually figured at one complete air change per hour in houses of tight construction. If there are small children in the family it may be necessary to increase this rate to a higher value because children run in and out of the house all day long with frequent door openings.

Caution. Many heating contractors habitually employ "rule of thumb" methods in application engineering for heating plant installations. They walk into a home, make a very quick visual survey, decide that a certain furnace capacity will heat the building and proceed to install the *next larger* size "for safety margin".

While this practice for heating surveys is not condemned, neither is it fuly accepted. There are heating contractors with sufficient experience to properly size every job in this manner, and the cost of the additional capacity in the larger furnace is seldom enough to make much difference. However, such methods cannot be used in cooling survey and application studies.

As pointed out elsewhere, the heat gain of a house is seldom, if ever, the same as the heat loss. Heat gain calculations are more involved because there are a greater number of heat factors to be considered. The heat gain estimate should be made in every case, without exception.

There is a greater difference in price per ton, or horsepower, for air conditioning equipment than there is for heating equipment. Where a furnace having 24,000 Btu per hr greater output may cost the customer $75 more than the calculated required size, an air conditioner having 24,000 Btu per hr over-capacity may cost him $300 to $600 more.

Futhermore, the excess capacity of the conditioner may increase operating costs, and provide lower efficiency and performance than one chosen to fulfill the exact requirements for cooling the house. This is discussed under Estimating Cooling Load.

A good policy to follow in residential cooling, whether new or conversion jobs, is to make an actual heat gain estimate for every survey and size the equipment according to that estimate and recommended practice. Do not use rule of thumb calculations.

The capacity of residential packaged air conditioners is rated in Btu per hour in steps of 12,000 Btu which represents one ton of refrigeration or cooling. Common central plant sizes are two, three and five tons, or horse-

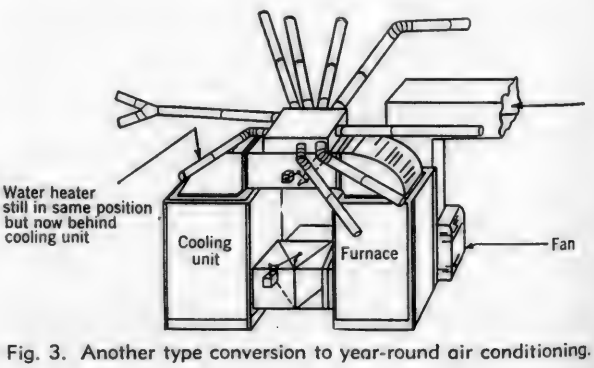


Fig. 3. Another type conversion to year-round air conditioning.

power. One size larger can often be too large and too expensive.

One ton of refrigeration is equal to the amount of heat absorbed by melting one ton of ice, and for air conditioning requires approximately one horsepower.

Existing Duct Systems

Most year-round conversion jobs will go into warm air systems with existing ducts. All types and methods of ductwork will be encountered, some good, some bad, and some mediocre. In either case, the supply and return duct should be checked and inspected thoroughly to determine its adaptability to the air conditioner and year-round use. Such inspection should start at the furnace plenum and terminate at the most distant register.

Measure the length, width and depth of the longest run and calculate the friction loss of that run. The resulting loss should then be checked against the performance data for the fan and motor to be used for summer air conditioning. If the total duct, filter, conditioner and register friction loss in the run is greater than the allowable loss at standard or normal operating conditions, it may be necessary to change the drive assembly, or the motor, or both.

When duct sizes and air volume are known, the friction loss per 100 ft may be determined by referring to the friction loss charts in *Heating and Ventilating Engineering Databook*, the Guide, the National Warm Air Heating and Air Conditioning Association Handbooks, or from other duct design books.

Duct elbows must also be considered and the equivalent feet of each elbow added to the resistance for straight duct.

Many jobs will be encountered where joist space has been enclosed to serve as ducts. Such practice may be permissible for heating alone but should not be used for summer cooling, especially in supply ducts, unless the interior of panned spaces is well insulated. Condensation may occur in this type of duct and damage to adjacent structure may result. Look for enclosed joists in each conversion job and replace with regular duct or insulate the interior space.

Figures 2 to 4 illustrate one method of completely converting an old gravity type furnace with blower to a year-round heating and cooling system. The gravity furnace has been removed but the supply and return ducts and the fan are left in their original positions, with the two units being placed in the most accessible locations where these ducts can easily be modified to fit the cap plenum.

Figures 2 and 3 are from an actual conversion job and the only duct work necessary was that connecting the two units, an extension on the return duct, and very slight rearrangement of the supply ducts at the plenum end. Figure 4 shows another possible arrangement of the same conversion job.

The registers in the living quarters of the house were old style, chain adjustable type mounted low in the walls. These were removed and modern, throw and angle adjustable types were installed and adjusted for deflection at a slight angle from the verticle to prevent the air from falling directly downward. See Registers for information on other types of supply openings for use with year-round systems.

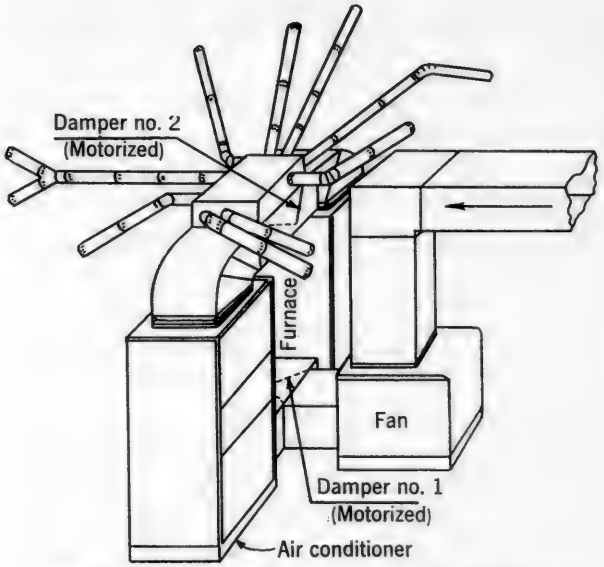


Fig. 4. A third approach to the conversion problem.

Duct Layout

There are many other possible duct arrangements which could have been used in this installation to reduce the expense of conversion and modification. Connecting duct layout will, in every case, depend upon the layout of the existing system, the job to be done, simplicity of modifications, cost of the job, and space limitations. The survey line drawing of the existing duct system should include sufficient data to permit office engineering of the modifications necessary at the plenum.

Each of the two units in the example could have had its own fan, and controls could have been installed to allow each fan to operate when necessary. Further, the units could have been placed closer together with return through one side or the bottom. They might also have been placed back-to-back or, for that matter, farther apart.

This customer wished to make use of the existing fan, which was in good condition and ample in size, and the layout chosen seemed best for the job to be done.

Two motorized dampers were installed to provide complete isolation of the out-of-season unit. One was located between the two units just ahead of the fan, and the other was installed in the supply plenum to prevent possible by-passing. The damper motors were controlled by the heating and cooling thermostats in a manner similar to that shown in the control wiring diagram in Fig. 20.

Fan Locations

A single fan to serve two units or a furnace alone, should never be located in the discharge or supply duct system. If the fan is installed to pull air through the warm air furnace a negative pressure will result around the combustion chamber. Products of combustion may then leak outwardly into the air stream to be carried into the living quarters of the house. Such a condition may prove to be extremely unhealthy and hazardous. This is probably the major reason why forced warm air furnace circulating fans are installed for *blow through* rather than for *draw through* operation.

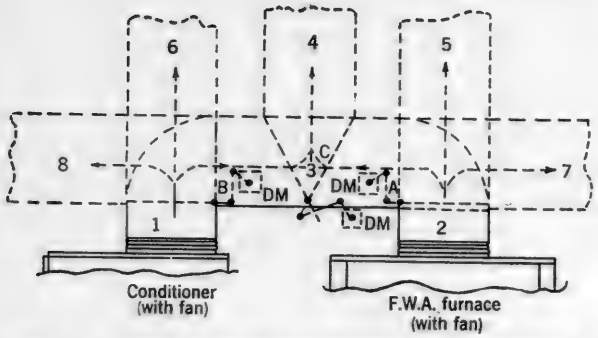


Fig. 5. Possible discharge arrangements and location of isolating damper for the typical installation in Figs. 3 and 4.

On the contrary, the fan in a summer cooling system or air conditioner may be installed for draw-through operation without fear of creating an unhealthy or hazardous air condition within the conditioned space. As a matter of fact, many types of summer air conditioners are equipped with draw-through or pull-through fan arrangement. The same efficiency may be expected from either type.

It is contrary to some codes, and general practice, to circulate hot air through the summer conditioner or cold air through the furnace. This is especially true where duct type gas- or oil-fired warm air heaters are concerned. It is wise to consult the codes on installations of this nature to avoid conflict and difficulty at some later date.

Discharge Arrangement

A number of discharge or supply duct plenum arrangements are shown in Fig. 5. When a furnace and a conditioner are located side-by-side, either of the duct arrangements may be used with equal efficiency. In the following list of arrangements the numbers are those appearing in the duct sections in Fig. 5, and only those sections in each item would be used.

(1) 1-3-2-7 (2) 1-3-2-5 (3) 1-3-5-2-7 (4) 2-3-1-8
(5) 2-3-1-6 (6) 2-3-1-6-8 (7) 1-3-2-4

It is possible, but unlikely, that the arrangement: 1-8-3-2-7 may appear necessary in some conversion jobs. If this occurs, difficulty will be encountered in complete bypassing of the out-of-season unit. The best solution to this problem would be to remove duct section 8, for instance, and attach to section 7 at or near the location of section 5 on the drawing.

Either of sections 4, 5, 6, 7 and 8 may be taken off 90 degrees removed from the plan positions shown.

Only one supply duct isolating damper is required in any arrangement from 1 through 7. The location of the damper (*DM*) may be *A*, *B* or *C*, depending upon the duct arrangement being used. However, another damper may be installed in the return splitter if found desirable or necessary.

Figures 6 and 7 illustrate typical and most commonly used methods of installing an air conditioner with an existing furnace for year-round operation. Note that isolation dampers have been used in both supply and return, except in Figure 6, thereby providing complete control of the air stream. Damper control may be manual or automatic in either case.

Insulation

Exposed supply and return ducts in unconditioned areas should have a minimum of one inch of insulation applied to reduce duct losses and to guard against surface condensation during the cooling season. Concealed ducts, especially those in horizontal positions over ceilings, should, where possible, be checked for possible surface condensation and insulated. Enough insulation should be applied to prevent condensation and thus avoid the possibility of water dripping down and seeping through the ceiling to ruin the exposed surface of the ceiling. Damage can thus be avoided.

It may be economically impractical to insulate the entire duct system and the next best thing must suffice. In this case, explain to your customer what may happen if surface condensation occurs on the ducts. Then come to some amicable agreement with him for remedial action after the system is operating and has been thoroughly checked.

When the job is complete and in operation, go over the entire duct system on typical design operating days and look for serious condensation. It may be wise to repeat this check several times before coming to a definite conclusion. If condensation is found, insulate only those sections of duct where damage to walls and ceilings are most likely to occur.

Much that may be said on existing duct also applies to new duct, and vice versa. However, there are a few important points to remember when designing a year-round duct system which will make that system more practical and satisfactory.

Air Quantity

It is generally agreed that different quantities of recirculated air may be required for heating and cooling in different geographical areas of the country. Obtaining the correct seasonal quantity or volume with companion apparatus may present a problem in many cases. Custom-built, year-round combination units, however, are usually equipped with the necessary provisions for reducing the air volume in winter. These may be in the form of

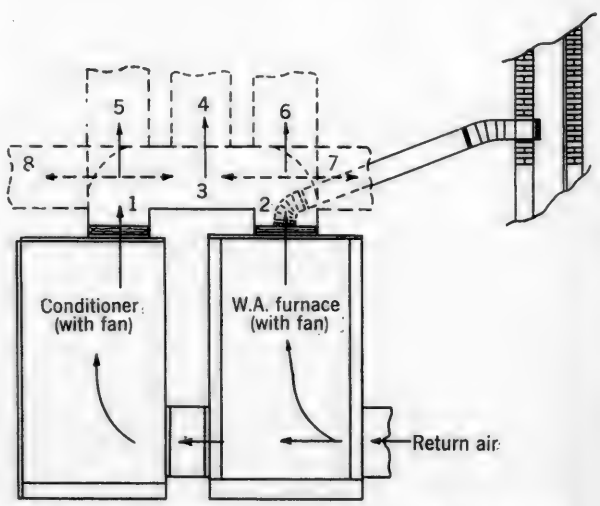


Fig. 6. Typical air conditioner installation with existing forced warm air furnace.

additional resistance dampers, vari-speed drive assemblies or two-speed motors.

Two-speed motors and variable speed drive assemblies are expensive and, therefore, not likely to be acceptable to your customer. The cheapest, and probably the best, solution is additional resistance dampers to reduce the summer volume to winter requirements. These may be added at the entrance to the main supply duct, in the combustion section, or at the entering or leaving side of the unit. If located in the main supply duct, they will require seasonal changeover, and may be made automatic by installing a damper motor to operate in phase with the seasonal air cycle dampers.

When resistance is added to reduce air volume in the duct system, fan motor horsepower requirements will change. Whether or not the required BHP will be in excess of the installed motor rating must be determined and the necessary action taken.

Most forced warm air furnaces are equipped with a fan for operation against 0.2 inches water duct resistance maximum, and the fan motor is rated accordingly. Table 1 lists the most common fan diameters and the maximum cfm which they will handle without excessive noise and motor overload.

Thus fan size is usually a good indication of air volume if it is not stamped on the furnace nameplate.

If the capacity of the fan is changed, the static pressure and horsepower will also change. To illustrate: Suppose you have a fan in a conversion job which is rated 1,200 cfm at 600 rpm against 0.2 inches water gage at 0.30 BHP. If capacity is raised to 1,500 cfm at 750 rpm, static pressure and brake horsepower may be determined as follows:

Static pressure = $(750/600)^2 \times 0.2 = (1.25)^2 \times 0.2 =$ 0.312 inches water.

Horsepower = $(750/600)^3 \times 0.30 = (1.25)^3 \times 0.30 =$ $1.95 \times 0.30 = 0.585$ BHP.

Thus the 300 cfm increase in air volume, increased the motor requirements from 0.30 to 0.59 BHP. The motor should be changed to a ½ hp motor as explained in the example. (Maximum motor load may be calculated by multipling the nameplate BHP of the motor by the factor 1.25). Resistance against which the fan will operate has increased to 0.312 inch water.

Design Problem

Example: In the horsepower equation, we found that we now need 0.585 BHP to obtain the fan performance required. The present requirement is 0.30 BHP. Assume the motor is ⅓ hp, then can we use this motor under the new requirements? We arrive at the answer as follows:

$0.33 \times 1.25 = 0.4125$ BHP.

TABLE 1.—MAXIMUM CFM FOR FAN DIAMETERS

Fan diameter DWDI*	Maximum CFM
9	800
10	1200
12	1800

*Double width, double inlet. Fan has an air inlet on each shaft side of the fan housing.

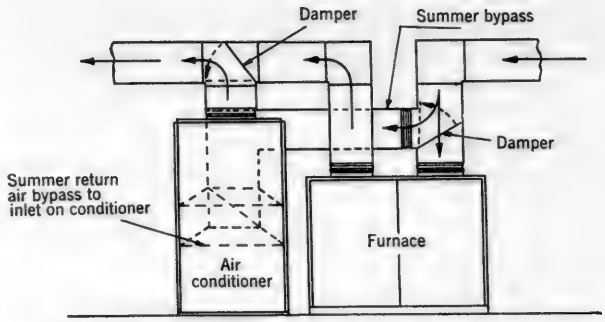


Fig. 7. Air conditioner installed into existing furnace and duct system.

Thus, the ⅓ hp motor is too small and we try the next larger size which is ½ hp. Then,

$0.5 \times 1.25 = 0.625$ BHP.

Since the available power is 0.625 BHP, and only 0.585 is required, a ½ hp motor may be used.

If no instruments are available to measure the increase or decrease in the capacity of the fan, and standard volume and speed are known, the new volume or capacity may be determined by use of the formula:

Capacity: (For increased volume or faster speed) = (New speed/old speed x cfm at old speed).

(For decreased volume or slower speed) = (Old speed/new speed x cfm at old speed).

Example (from above)

Capacity = $750/600 \times 1{,}200 = 1.25 \times 1{,}200 = 1{,}500$ cfm (an increase of 300 cfm)

The location of the fan will determine what has to be done to it to balance the air flow for both seasons. If one fan is to be used for both units, proceed as follows:

(1) Check total friction loss of duct, furnace and conditioner.

(2) Determine from known existing furnace cfm and heat gain estimate, or nominal volume of fan on conditioner, which cycle requires more air and how much.

(3) When one unit requires a considerably greater quantity than the other, 200 cfm or more, calculate required resistance which must be added to the *low volume unit* to maintain its standard air flow. Install resistance as adjustable inlet louvers or outlet damper in or on the unit itself. Add friction to total for low air volume unit.

(4) Determine which unit has the greater total friction loss, including ducts.

(5) By formula, determine what fan speed and motor horsepower are required to move the required air quantity through each unit at the total static pressure for that unit and the remainder of the duct system. (This may include some friction in the other unit if return air is brought through it).

(6) Adjust fan speed, and increase size of motor if necessary, to provide the greater air volume at necessary static pressure to overcome the highest calculated friction.

The air volume of all self-contained packaged heating or cooling units is the quantity of air determined necess-

TABLE 2.—RECOMMENDED DUCT AIR VELOCITIES FOR RESIDENTIAL YEAR-ROUND AIR CONDITIONING

Duct Section	Air Velocities, Feet per Minute
Supply (conditioned Space)	
Main Duct	800—1,000
Branch Ducts	600—700
Risers	500—600
Register Face	400—500
Return (Conditioned Space)	
Main Duct	600—800
Branch Ducts	500—700
Risers	300—500
Outside Air Sources	
Intake	400—500
Outlet	800—1,000

ary to provide a certain amount of heating or cooling capacity within the space. This volume also takes into account the necessary diffusion temperature at the outlet for air at standard design conditions. This is why we must attempt to maintain standard air volume ratings in both heating and cooling units when combined as year-round equipment.

The final analysis of the pros and cons of how much air to use boils down to the procedure of proper register adjustment and air system balance. If a system has one fan, or two, the first thing to do is to adjust the outlets for best year-round volume, throw and spread. This may be an average point between the performance of the two fans, or the best possible adjustment in systems using one fan. If there is too much or too little air from either fan, additional adjustments in speed will usually suffice to remedy the situation. Faster fan speeds sometimes exceed the rated motor horsepower and it then becomes necessary to remove the original motor and replace it with a larger one.

The main reason for stressing the importance of adjustments, throw and spread, as concerns a residential installation, is to provide a maximum amount of freedom from manual operations by the user. The entire system should be made as simple and easy to operate as possible. This means the user should not have to juggle registers, isolating dampers, fan switches, valves and thermostats in order to enjoy the comforts of year-round air conditioning. In every job strive to make complete control a very simple procedure. Proper and permanent adjustment of the entire air system is a major step toward single control of the installation.

New duct systems often become a very perplexing problem in old homes and considerable planning is necessary. It is often impossible to install stacks and risers within the walls and exposed locations become necessary. These locations should be selected to present to view a minimum of duct surface and should be furred-in and plastered or ceiled when possible.

Utility rooms, closets and bed rooms are the best locations for risers to registers, or trunks to the attic, when the equipment is located in the basement. The attic duct system is by far the best in such cases and eliminates much exposed duct. The trunk may be taken up through a closet or a corner of a bedroom. This is based on the assumption that high wall registers are to be used, which we prefer for year-round operation.

Duct systems for combination heating and cooling apparatus should be as short and direct as possible, well insulated in unconditioned areas, and sealed. If leakage into, or out of, ducts occurs, the capacity of the apparatus will vary in proportion to the quantity of air passing through the leaks and the Btu per hour lost or picked up. The usual result of duct leaks is a loss in capacity of the unit, whether on the cooling or heating cycle.

Other than this discussion, the design of year-round duct follows the same basic design procedure practiced for any other type of system.

Recommended air velocities for year-round system are given in Table 2.

Air Changes

The number of times that the cubic volume of air within a given space can be changed in one hour by the volume of air introduced at the register is known as the total number of air changes per hour for that space. Total air changes for any treated space may be calculated by the use of the following formula:

$$N = \frac{60 \times cfm}{Cv}$$

where

N = total number of air changes per hour.

cfm = total air introduced to space at the register. (cubic feet per minute).

Cv = volume of room in cubic feet.

Table 3 shows recommended recirculation air changes per hour.

Ventilation Air

The introduction of ventilation air in residence cooling is not recommended, unless conditions necessitate such practice, and then only if an equal quantity of air is exhausted. The exhaust method may be a small kitchen exhaust fan or a window may be opened just enough to exhaust the proper quantity of air.

A certain amount of ventilation air is, of course, always desirable but the economics of residence cooling is often the decisive factor as to whether or not it will be used. For example: To treat 250 cfm of ventilation air at average design conditions, approximately 7500 Btu per hr are required. If the total heat gain, before ventilation air load, is very close to a certain size unit, it may be necessary to select the next size larger unit to handle the load. If the first selection were a close 3 hp, a 5 hp unit will be required but will be almost two tons over-size.

Such a selection would be disadvantageous for a number of reasons, including: (1) higher first cost, (2) excessive and unnecessary capacity, (3) short-on and long-off cycles, (4) poor control of humidity.

Ventilation in kitchens and bathrooms is sometimes recommended to reduce the total cooling load. Pay careful attention to such procedure because excessive exhaust ventilation in such spaces may increase the total load. For each cubic foot of air exhausted one should be introduced, and it should come through the air conditioner if design conditions of dry and wet bulb temperatures are to be maintained. Always inquire about ventilation air

requirements so that original calculations may include this extra load if necessary.

Air Cleaning

Air conditioning alone does not provide filtering and cleaning of the circulated air. Filters, or some other method of removing dust and pollen must be employed in summer cooling as well as in winter heating. Throw-away type filters are quite popular but do not afford the efficiency necessary for complete removal of dust, smoke, pollen and other microscopic foreign matter. The electrostatic air cleaner can provide up to 90 percent air cleaning efficiency.

Estimating Cooling Load

Heat gain calculation (cooling load estimate) for a residence is very similar to the method used to estimate the heat loss for heating; the major difference being in design temperature. Actually, heat gain estimating may be called a reverse process of heat loss estimating since in cooling we determine how much heat is being picked up by the space and how much of it must be dissipated or removed to maintain a certain temperature. In heating we must determine how much heat is required to be added to the space to maintain a certain space temperature because of heat loss.

Heat gain and heat loss are very seldom equal quantities of Btu per hour. Therefore, it is necessary to calculate the heat gain of every house being surveyed for air conditioning, regardless of the nature of the proposed installation.

Forms supplied by various manufacturers for calculating residential loads may vary considerably in methods used to arrive at the unit capacity requirements. This is due, in part, to the fact that up until a year or so ago, very little was known about the peculiarities of heat transmission and heat storage in the average occupied home. Loads were based upon the same conditions applied to commercial air conditioning and this resulted in oversized equipment and unsatisfactory performance. This was difficult to understand, at the time, but it became evident that different conditions exist in commercial buildings and residences. The problem was, therefore, one of determining what made the difference, how much difference, and why.

Various institutions built test homes and installed experimental air conditioning of which the capacity could be varied. They found that actual requirements might be anywhere from 50 to 100 percent of the calculated load, depending upon house construction and occupancy. Further, they discovered that the average frame, or brick and frame house maintained a constant temperature for a longer period of time after the air conditioner stopped than was found true in commercial buildings. This is thermal inertia, better known as fly wheel effect. It is the ability of a structure to maintain a relatively constant indoor temperature although outdoor temperature may vary several degrees either way. All up-to-date calculation methods make use of this heat storage factor in one way or another.

Much work remains to be done on residence load estimate methods before any type can be accepted as accurate and final. In the meantime it is sufficiently accurate to use any of the methods practiced by the large manufacturers or recommended by the various associations involved in finalizing the methods.

TABLE 3.—RECOMMENDED RECIRCULATION (SUPPLY), AIR CHANGES PER HOUR

Application	Location	Approx. Total Air Changes per Hr.	
		Heating	Cooling
Residences	Baseboard—horizontal discharge	3—6	(Note 1)
	Floor—vertical discharge	3—6	6—12
	High wall—horizontal discharge	5—9	6—12
	Ceiling—with diffusers	5—8	6—12

Note 1: Baseboard registers may be used with cooling if vertical discharge adjustable types are used. Number of air changes will vary from 4 to 10 or 12, depending upon vertical discharge angle. Adjustable angle and number of air changes for minimum draft across room and floor, and for best distribution.

We have been reducing the gross gain by 20 percent, as determined by the standard commercial instantaneous heat gain method, to arrive at a final total more representative of actual house requirements. This policy has proven to be quite accurate and equipment so sized has been highly satisfactory.

Humidity and temperature must be maintained at a fairly constant level in the home if conditions are to be improved by air conditioning. Equipment selected on the basis of the commercial type instantaneous heat gain, without a correction factor, cannot maintain comfort conditions. It is actually oversized for the application.

Equipment must be so sized that long running cycles will be normal operation. If long off cycles predominate, space temperature will not reach cut-in point (flywheel effect) before relative humidity has risen to an uncomfortable condition. The rapid humidity increase is due to infiltration, latent heat of people and utilities, and re-evaporation of coil condensate. Nothing inside the average home will absorb moisture to any great extent. Consequently, most of the moisture is suspended in space air causing the extremely rapid rise in relative humidity. This must be prevented.

The instantaneous heat gain calculation should include the following sources:

(1) Sun load on exposed wall, windows and roof.
(2) Transmission load on shaded walls and windows. (Not exposed to sun at the hour calculation is made.)
(3) Floor when not on ground (over hot basement, crawl space, rooms not conditioned).
(4) No latent heat from bathroom or kitchen.
(5) Sensible and latent heat of occupants.
(6) One-half the estimated electric appliance wattage for peak load usage. (Household electric appliances are in use only an hour or two per day while the instantaneous estimate assumes constant usage.)
(7) One infiltration air change per hour in average construction; fifty percent of that figure for tight construction. The one change per hour of infiltration air for a given space may be calculated as follows:

$$\text{Infiltration, cfm} = \frac{\text{Width} \times \text{Height} \times \text{Length}}{60}$$

(8) No ventilation air unless specified by customer. If kitchen and bathroom exhaust fans are used, a quan-

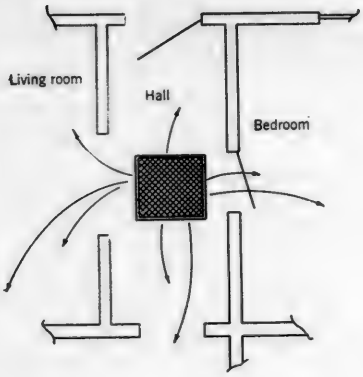


Fig. 8. Central floor register for gravity warm air furnace.

tity of fresh air equivalent to the difference between calculated infiltration air and ventilation air should be introduced through the conditioner.

(9) Inquire about house parties and consider the load due to additional people only if parties are very frequent and well attended.

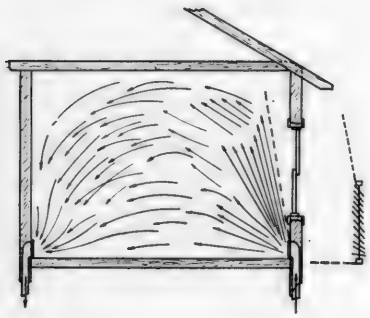


Fig. 9. Baseboard outlet — vertical face.

(10) Where laundry equipment within the space consists of both washer and dryer, recommend that dryer be vented to the outside and neglect equipment load. If not vented, include one-half the load of dryer only if used as often as once each day.

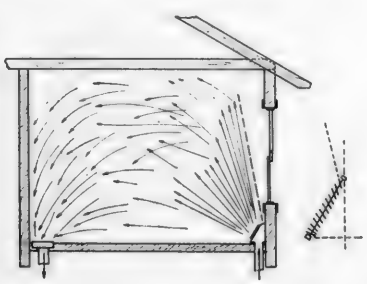
In self-contained units, the heat from fan and compressor motors has been taken into consideration in the rating of the unit and need not be added to the total load. It should be considered in field-assembled systems if motors are in air stream.

Instantaneous heat load estimates are calculated on the heat gain at a certain hour of the day; usually between 2 and 4 P.M. since the sun load is greater at these hours than at others. Estimate forms explain this procedure and give heat transfer coefficients for these hours.

When the estimate is completed, multiply the total calculated load by the factor 0.80 (100 percent less correction factor of 20 percent to prevent oversizing equipment) and divide the net results by 12,000. This is the ton or horsepower rating of the required conditioner. Select unit according to this figure.

The correction factor of 0.80 is to be used only with commercial type instantaneous heat gain estimates or on any estimate form not designed specifically for residential heat gain calculation. Special residential estimate sheets include all information necessary for properly selecting the required conditioner.

Fig. 10. Baseboard outlet—angle face.



Registers for Air Distribution

Satisfactory air distribution in year-round air conditioning depends greatly upon the proper choice of supply registers and grilles, and return grilles. You will encounter many different types and styles of these outlets on systems to be converted and it is well to become familiar with those most commonly used. In many cases it will be necessary to change old style registers to modern designs to maintain proper distribution for cooling and heating. Others will require little more than additional adjustments.

It should be remembered that satisfactory year-round air distribution also depends upon educating the owner in the technicalities of register adjustment. It is difficult to adjust a set of registers to suit every member of a family and more often than not the adjustments in individual rooms are changed to suit the most frequent occupant. Bedrooms, sewing rooms, den, kitchen and library are very good examples of this practice.

Balanced year-round air distribution often requires considerable attention before a satisfactory adjustment is found which will supply the correct amount of air to handle both cooling and heating loads. Once this adjustment is made, it may be wise to fix the vanes, diffusers or louvers so that the difficulty of changing them discourages extra changes.

On the other hand, the owner can easily be instructed in simple adjustment so that he may change distribution to suit his requirements. When this is done it is standard practice for the installer to explain that mal-adjustment is the responsibility of the owner, and that service calls for re-balancing must be paid for, in-warranty or not.

Central Floor Registers. Registers of this type, Fig. 8, are most often found in old homes heated by gravity type warm air furnaces. These registers are not suitable for year-round conditioning and must be replaced by a number of outlets of another type. The type to be used de-

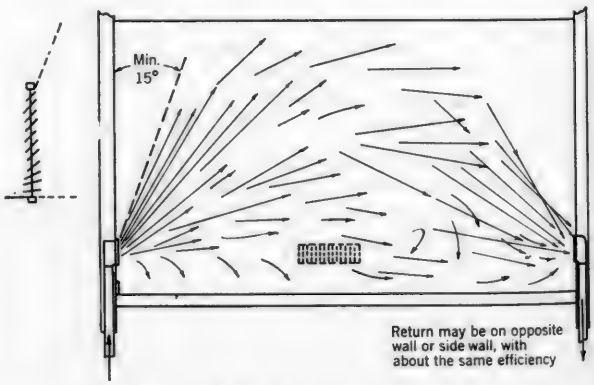


Fig. 11. Air flow from low wall register.

pends upon the house structure and accessibility of floor, walls and ceilings. This situation should be covered in the original survey and the conversion job engineered around the easiest, most practical air distribution system.

Baseboard Registers. Most common in homes which have been central plant heated some time after construction are the outlets of Figs. 9 and 10. Many of these are conversions from gravity central register to gravity duct jobs.

Ducts may often be used as is but new adjustable registers are required to obtain proper distribution. The throw and spread should be adjusted toward the vertical, similar to pattern illustrated, but not so much so that cool air will fall directly upon itself. The spread and vane patterns are shown in the small sketches that are parts of Figs. 9 to 14.

Fairly good distribution may be had from either type providing good judgment is used in selecting new registers and in the necessary adjustments.

Low Wall Registers. Similar in performance to baseboard outlets but simpler to adjust for year-round use, is the register of Fig. 11. Replace old register with modern adjustable types and adjust throw and spread for best performance. Fairly satisfactory distribution may be expected.

High Wall Registrars. Use of high wall registers is considered one of the best methods. They are easy to adjust and balance; replace old style faces, if necessary. Distribution and pattern are similar to that shown in the illustration.

Ceiling Outlets. Ceiling outlets, Fig. 13, are becoming very popular in year-round air conditioning because of their efficient performance, ease of adjustment, attractive appearance and space saving features. They may be used in any house where supply ducts may be taken to attic or between floors. Available from a number of sources in a wide variety of sizes and designs, they may be had with or without an attached light fixture. Throw and spread may be changed to suit the installation. The illustration shows a typical year-round pattern.

Floor Registers. Floor registers, Fig. 14, are often found in older homes and are difficult to adjust for year-round use. Many of these have no adjustment facilities and must be replaced with modern registers. Outlet velocities will vary from 300 to 500 fpm according to the locations and the use of adjacent space. The most common arrangement of floor outlet and return grille is shown in Fig. 14. Recommended distribution pattern is also shown.

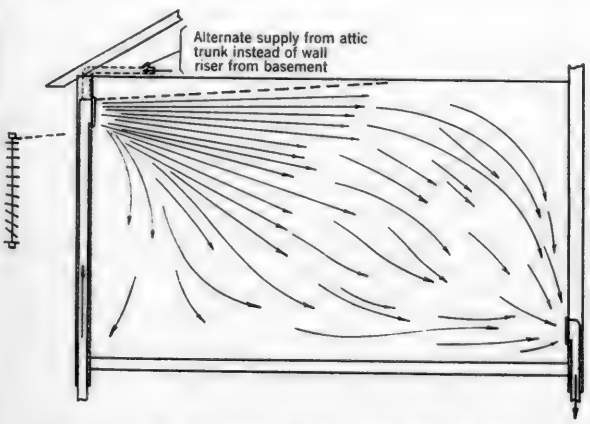


Fig. 12. Air distribution from high wall register.

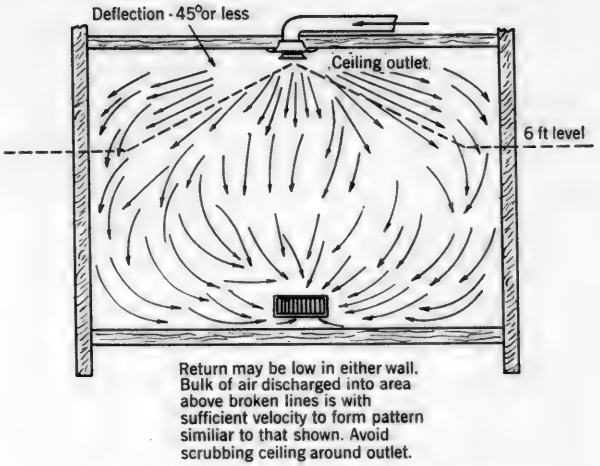

Deflection - 45° or less
Ceiling outlet
6 ft level
Return may be low in either wall.
Bulk of air discharged into area
above broken lines is with
sufficient velocity to form pattern
similiar to that shown. Avoid
scrubbing ceiling around outlet.

Fig. 13. Air pattern from ceiling outlet.

It is assumed that most duct work in conversion jobs will be fairly well fixed when the job begins. This includes supply and return duct, and supply and return grilles. However, some changes in supply and return grille locations may be necessary in many jobs. When this occurs, try to locate these grilles in the best possible places for good, draft-free circulation.

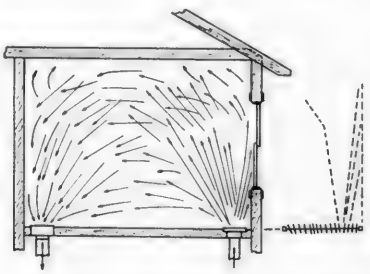


Fig. 14. Floor registers are difficult to adjust.

Best return locations are under windows on outside walls or just on outside walls. Best supply locations are on inside walls, blowing toward outside walls, or in the center of the ceiling. Many homes will have supply and returns on the same wall and these, too, may be made to perform satisfactorily by employing proper supply face velocity, throw and spread.

Register deflection should never be set to scrub wall or ceiling with high velocity air directly around the outlet. While ordinary filters do a good job removing the heavier dust and dirt particles, the very small ones often get through to the treated space. These microscopic particles will blacken the impingement area and customer dissatisfaction will result. Air may be directed against a wall or ceiling some few feet removed from the outlet without fear of surface discoloration. Velocity of the air has decreased considerably at that distance and the dust particles drop out, or there is insufficient air force to jam them permanently against a surface.

The grilles of all supply outlets should be well sealed against the surface of wall or ceiling. Unless this is done, air leakage will cause streaking of the adjacent surfaces.

Most any arrangement of supply and return locations can be made to give some degree of satisfaction by apply-

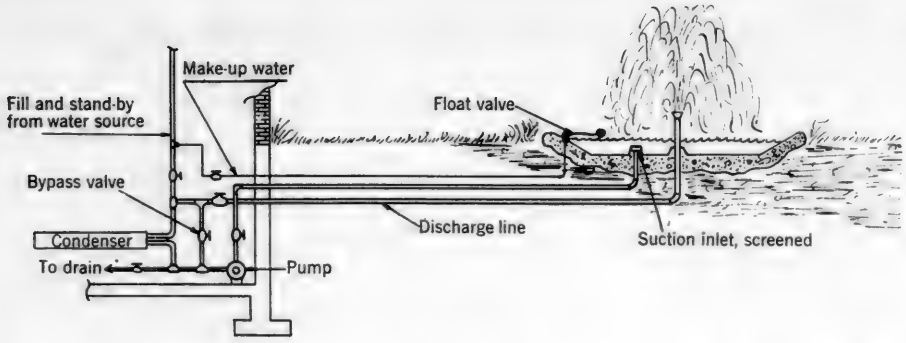


Fig. 15. Typical spray fountain or pond and piping to water cooled condenser.

ing equal quantities of patience, common sense, and the most suitable type of supply register available. It is not always necessary to cut a house to pieces to convert from a winter hot air system to year-round conditioning. The job can be made difficult by improper and insufficient planning and engineering.

Every detail of the existing system should be analyzed thoroughly to determine just what its capabilities really are rather than quick conclusions and decisions that may lead to trouble for the contractor and dissatisfaction on the part of the owner. Snap judgment may result in serious difficulty on the job; it may run the job price up so high that the customer will not accept it, and it may result in permanent discredit to the contractor.

Condenser Water

Unless the unit being installed has an air cooled condenser, a source of condenser water will be required. This may be from city mains, well, lake, river, creek or brook. The manner of utilizing the water from the source determines the cost of water for operation.

When it is necessary to purchase water from any source, the least expensive long range operation may be realized by using some sort of water saving device. These include water cooling towers, fountains, spray ponds, and similar methods of cooling the water and recirculating it to the unit. The water cooling tower is the most popular method.

If water must be wasted to the drain, city water is usually the most expensive of all sources. If there is a clean, natural source nearby, it may be cheaper to pipe this water to the unit. Small brooks and streams may be utilized easily by ponding them, if necessary, and properly screening the suction pipe inlet. Of course, any stream must have a water flow sufficient for unit requirements. Brook water should, in most cases, be returned to the stream below the inlet pipe. Water lines from all natural sources should be provided with a sand and sediment collector or trap.

Spray ponds, Fig. 15, and fountains may be made decorative attractions in a garden or on the lawn and will rarely be recognized as actual work-performing, water saving apparatus. The only operating expense for these methods is pump motor electric power and make-up water. The amount of water actually sprayed should be about twice the amount that is circulated through the condenser.

The amount of necessary labor, construction, and material for water conservation must be taken into consideration on every air conditioning job, regardless of the nature of the installation.

It will often be found more economical to use an air cooled condenser in residential jobs. There are a number of manufacturers producing air cooled condensers in a variety of sizes for the trade. The condenser must be selected with care to guard against undersizing, and overloading during hot weather.

Unit air conditioners, equipped with air cooled condensers, may be installed with water cooled condensers so that the water circuit may be used as a booster or supplemental condenser during periods of very hot weather. This should not be necessary, however, if the air cooled condenser is correctly selected.

Air cooled condensers may be selected from manufacturer's tables which may be obtained from sales representatives, wholesalers or distributors. The unit chosen should have a minimum capacity equal to or greater than the design condition rating of the conditioner with which it is to operate.

TABLE 4.—TONS OF REFRIGERATION FOR NATURAL DRAFT COOLING TOWERS
Based on 3 mph broadside wind

Size No. of Cooling Tower	GPM of Water per Ton										
	3			4					5		
	Wet Bulb Temperature, F										
	65	70	75	65	70	73	75	78	75	78	80
	Cold Water Temperature, F										
	75	80	85	73	78	81	83	86	82	85	86
1	5.5	6.2	7.0	4.1	4.6	5.0	5.3	5.7	4.3	4.6	4.3
2	8.9	10.1	11.4	6.7	7.5	8.1	8.5	9.1	6.9	7.4	6.9
3	11.9	13.4	15.1	8.9	10.0	10.8	11.3	12.2	9.2	9.9	9.3
4	17.2	19.4	21.9	12.9	14.5	15.6	16.4	17.6	13.4	14.4	13.5
5	22.1	25.0	28.2	16.6	18.7	20.1	21.1	22.7	17.2	18.5	17.3
6	28.7	32.5	36.7	21.5	24.3	26.1	27.4	29.5	22.4	24.1	22.5

TABLE 5.—TONS OF REFRIGERATION FOR MECHANICAL DRAFT COOLING TOWERS
Based on 250 Btu per minute per ton dissipated by the cooling tower

Size No. of Cooling Tower	3 gpm per Ton								4 gpm per Ton					
	Wet Bulb Temperature, F													
	65	70	70	75	75	78	78	80	70	70	75	78	78	80
	Cold Water Temperature, F													
	75	75	80	80	85	85	87	86	77.5	82.5	82.5	87.5	89.5	88.5
	Hot Water Temperature, F													
	85	85	90	90	95	95	97	96	85	90	90	95	97	99.6
1	3.1	2.1	3.7	2.5	4.4	3.7	4.5	3.6	2.6	4.4	3.1	4.4	5.4	4.3
2	4.0	2.7	4.7	3.3	5.7	4.7	5.8	4.6	3.3	5.6	3.9	5.6	6.9	5.5
3	7.6	5.2	8.9	6.2	10.8	8.9	10.9	8.8	6.3	10.6	7.5	10.7	13.2	10.4
4	12.2	8.2	14.2	9.9	17.1	14.1	17.3	13.9	9.9	16.8	11.9	16.9	20.6	16.4
5	17.8	12.3	21.1	14.7	25.4	21.0	25.7	20.6	14.7	24.9	17.7	25.0	30.6	24.4
6	26.6	18.1	31.3	21.6	37.7	31.3	38.1	30.7	21.8	36.9	26.3	37.3	45.5	36.2
7	38.7	26.4	45.7	31.7	55.0	45.5	55.5	44.6	32.0	53.7	38.2	54.0	66.3	52.7

Cooling Tower Selection

Sample rating tables for natural draft and mechanical draft cooling towers are given in Tables 4 and 5. Table 4 shows the choice of 3, 4 or 5 gpm of water per ton of refrigeration, local design wet bulb temperature, the temperature of the cooled water leaving the tower (temperature off tower), and tower capacity in tons of refrigeration at various wet bulb temperatures. A water rate of 3 gpm per ton through the tower is considered minimum for best condenser performance in most localities.

Table 5 shows a choice of 3 or 4 gpm per ton through the tower, wet bulb temperature, cold water temperature, and temperature of water entering the tower (temperature on tower). This table is essentially the same as Table 4 except that it is for a mechanical draft tower.

The method of selecting the proper water cooling tower is the same for either table. However, the tower must be selected from the table for that particular tower since there is some difference in the capacities of natural and mechanical draft towers and in the capacities of towers by different manufacturers.

For the most economical first cost and operating cost in tower selection, careful consideration of water rate and physical size are required. The tower which will give the right leaving water temperature, at the design wet bulb temperature, with the lowest rate is to be preferred.

For instance, a natural draft tower is needed for a 5 ton conditioner. Local wet bulb temperature is 75F. In Table 4, under 3 gpm and 85F leaving water at 75F WB, a Size 1 tower will have a capacity equivalent to 7 tons of refrigeration. These conditions give a 10 deg approach to wet bulb temperature which is satisfactory. Note that if the WB temperature drops to 70F or 65F, the Size 1 tower will provide decreased capacity, if the approach remains at 10F, but that sufficient capacity is still available at 3 gpm water rate.

If 4 gpm of water per ton is circulated through the tower, at 75F WB temperature of the surrounding air, the leaving water temperature will be 83F and tower capacity will be 5.3 tons. The available capacity at these conditions may be slightly low for safe operation of a 5-ton conditioner.

The Size 1 tower will have sufficient capacity at 3 gpm and at the WB temperatures indicated.

It can be seen from the table that a Size 2 tower will have more than sufficient capacity at either of the stated conditions. However, the cost of the tower and water pump, plus the larger size of the tower, may be against its economical use.

Assume the 5-ton unit is to be operated at 80F entering air and approximately 55 percent relative humidity, and it will require 11.6 gpm of 85F condenser water. The Size 1 tower must recirculate 15 gpm (3 gpm per ton). Therefore, the difference between 15 gpm and 11.6 gpm must be bypassed around the condenser as shown in Fig. 16.

The quantity of water necessary to be circulated through a given water cooling tower in order to obtain efficient operation is fairly definitely fixed. This quantity of water is much more than is required to be circulated through the condenser of the air conditioner. In order to regulate the amount of water through the condenser and still maintain the fixed circulation rate through the tower, a water bypass must be installed between the tower supply and suction pipes. A typical self-contained conditioner and water tower installation is shown in Fig. 17.*

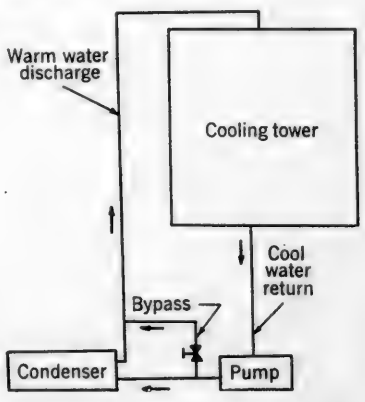
If a mechanical draft (forced or induced) tower is to be used, the selection would be made from the manufacturers capacity table such as shown in Table 5. Note that Size 2 tower would be ample to provide sufficient cooled water for a 5-ton unit at the same conditions used in selecting a natural draft tower. At 75F wet bulb temperature, 85F water off the tower could be expected with a 10 deg approach to wet bulb temperature.

Water Pump and Piping

The water pump should always be selected on the basis

*By permission of H. A. Blair, Westinghouse Electric Corp. Air Conditioning Division, Hyde Park, Mass.

Fig. 16. Arrangement of piping for the cooling tower.



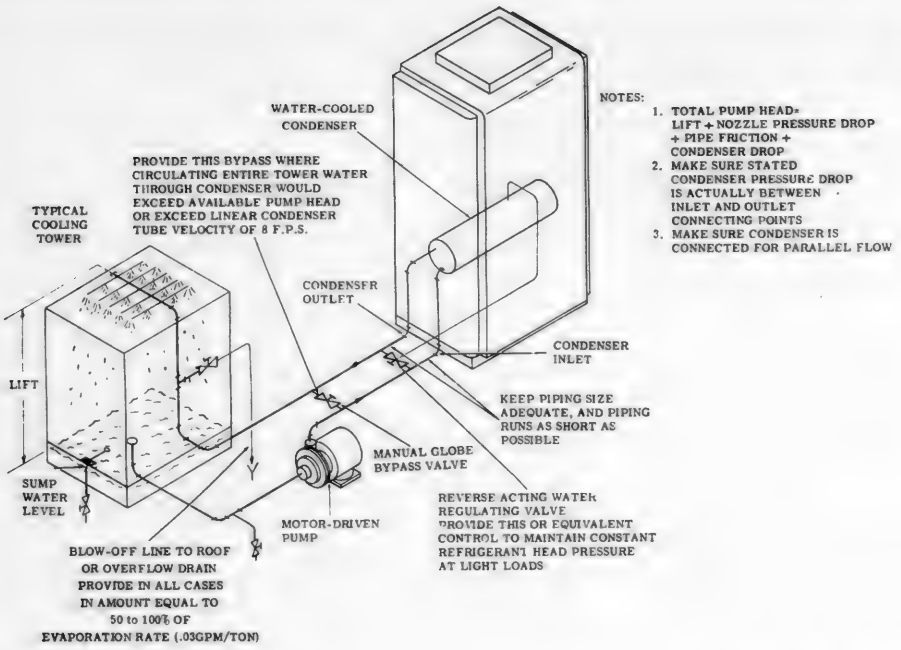

NOTES:
1. TOTAL PUMP HEAD= LIFT + NOZZLE PRESSURE DROP + PIPE FRICTION + CONDENSER DROP
2. MAKE SURE STATED CONDENSER PRESSURE DROP IS ACTUALLY BETWEEN INLET AND OUTLET CONNECTING POINTS
3. MAKE SURE CONDENSER IS CONNECTED FOR PARALLEL FLOW
WATER-COOLED CONDENSER
PROVIDE THIS BYPASS WHERE CIRCULATING ENTIRE TOWER WATER THROUGH CONDENSER WOULD EXCEED AVAILABLE PUMP HEAD OR EXCEED LINEAR CONDENSER TUBE VELOCITY OF 8 F.P.S.
TYPICAL COOLING TOWER
CONDENSER OUTLET
CONDENSER INLET
LIFT
KEEP PIPING SIZE ADEQUATE, AND PIPING RUNS AS SHORT AS POSSIBLE
MANUAL GLOBE BYPASS VALVE
SUMP WATER LEVEL
REVERSE ACTING WATER REGULATING VALVE PROVIDE THIS OR EQUIVALENT CONTROL TO MAINTAIN CONSTANT REFRIGERANT HEAD PRESSURE AT LIGHT LOADS
MOTOR-DRIVEN PUMP
BLOW-OFF LINE TO ROOF OR OVERFLOW DRAIN PROVIDE IN ALL CASES IN AMOUNT EQUAL TO 50 to 100% OF EVAPORATION RATE (.03GPM/TON)

Fig. 17. Typical arrangement of self-contained conditioner and cooling tower.

of gpm and pumping head, with pump motor horsepower a secondary consideration.

A pump for the above examples would have a capacity of 15 gpm or more. The pump selected must circulate the full amount of water required through the tower regardless of the amount passed through the condenser.

The working head against which the pump must operate is made up of the following:

(1). Head required to elevate the water from the circulating pump to the base of the tower.
(2). Head required at base of tower to force water up to and through the nozzles.
(3). Friction head loss through condenser.
(4). Friction head loss in piping and fittings.
(5). Suction lift to pump. (Depends upon installation).
(6). Additional head of approximately 10 percent for contingencies.

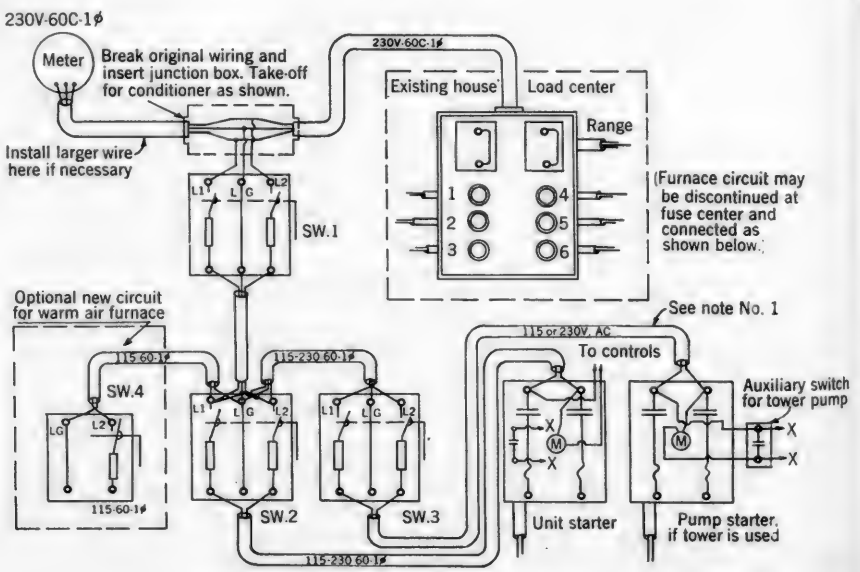
Where a tower is installed above the pump, in a direct water circuit, the pressure produced by the head of the suction line will off-set an equal head in the discharge pipe without the use of the pump. Therefore, the discharge head due to the height of the tower may be neglected. This does not apply to systems using a pumping tank or open sump external to the tower basin and on a level with the pump.

"Head" may be defined as the number of feet in vertical height against which the pump must raise the water plus friction loss in pipe, nozzles, etc.

Pump and Pipe Sizing

The following example illustrates the procedure for determining pipe sizes and selecting the water circulating pump. It will be assumed that the Size No. 1 natural draft tower has been selected to operate with a 5-ton air conditioner.

Fig. 18. Suggested single phase wiring for residential unit with furnace and water tower. Note: (1) The 115-volt circuit may be run to tower instead of 230-volt as shown. All circuits may be changed to 3-phase switches and starters.



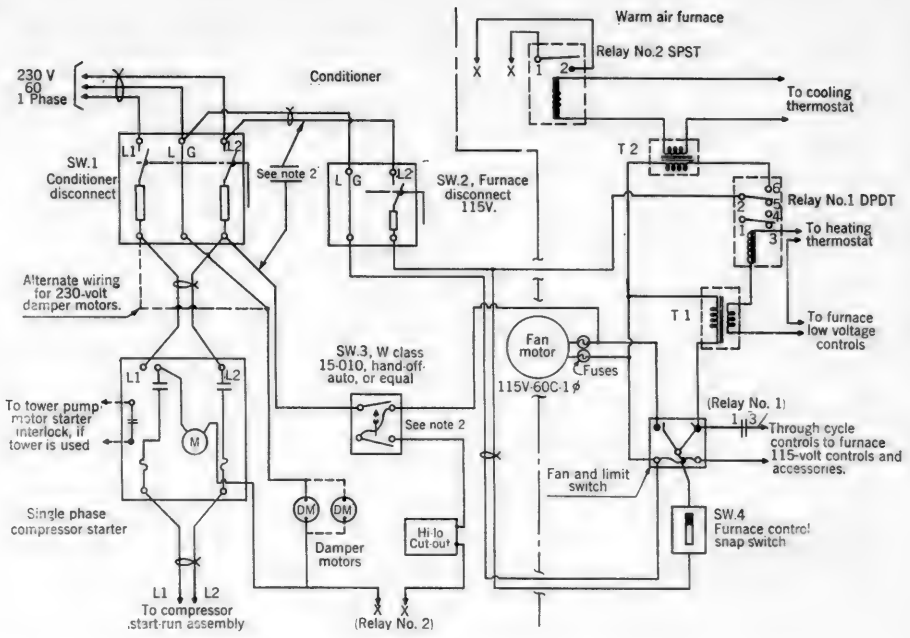


Fig. 19. Companion operation of air conditioner and warm air furnace. One fan serves both units. Notes: (1) Jumper must be added as shown. (2) Feed switch 2 and 3 are from some line. Observe line-to-ground polarity throughout. (3) T1 and T2 are low voltage transformers, heating service type; relays 1 and 2 are to match transformers. (4) Thermostats are of the low voltage type.

The water tower is 25 ft above the pump and condenser. The water circuit is direct suction from the tower basin. (The piping is similar to Fig. 17.) Required water flow is 15 gpm through the cooling tower and 11.6 gpm through the condenser.

A water velocity of about 5 ft per second represents average practice in water tower piping. From the water velocity table for fairly rough pipe*, water velocity in a 1¼-inch pipe would be approximately 3.6 ft per second. In a 1 inch pipe, the velocity would be about 10 ft per second, which is high. Use the 1¼-inch pipe for both suction and discharge piping.

In calculating friction loss in the piping assume that all the water flows through the condenser. From appropriate piping tables determine the equivalent lengths of straight pipe having the same pressure drop as the various fittings:

10 standard elbows (10 x 4)	=	40.0
3 couplings (3 x 1.2)	=	3.6
6 standard tee through run (6 x 1.2)..	=	7.2
Total		50.8 ft

Assume 50 ft of straight pipe in the remainder of the piping system. Then the total is 50 + 50.8 = 100.8 or 101 ft. To find pressure drop in feet of water per 100 ft of pipe multiply the pressure drop in pounds by 2.3. Thus, pressure drop in pounds for 100 ft of 1¼-inch pipe at 15 gpm = 3.6 psi. Therefore, 3.6 × 2.3 = 8.3 ft of water.

In this case there is no static head because the weight of the water in the suction pipe from the tower basin to the circulating pump balances the water in the discharge pipe from the pump to the base of the tower.

Dimension and engineering data tables are provided by manufacturers and they show the total head at the base of the tower which includes the friction loss in the discharge pipe from the base to top of tower and the loss through the nozzles. Assume that the head at the base of the tower is 23 ft.

Calculate the total pumping head, assuming all water goes through the condenser.

Friction loss in piping	8.3 ft
Head at base of tower (from manufacturer's tables)	23.0 ft.
PSIG pressure drop for quantity of water through condenser (from unit performance data) 9.6 × 2.3	22.0 ft.
	53.3 ft.
10% margin of safety	5.3 ft.
Total pumping head	58.6 ft.

From pump manufacturer's table and data, select a pump to deliver 15 gpm against a head of 60 ft.

If it is anticipated that the tower water rate will be increased at some future time, the pipe and pump must be selected for the anticipated quantity of water to be circulated. The reverse acting water regulating valve may then be set to operate in parallel with the manual bypass to control condenser water rate and condensing (head) pressure. A larger tower may also be used with the water rate controlled in this same manner.

By proper adjustment of the condenser bypass globe valve, the required gpm of water will flow through the condenser.

Water pump and piping for mechanical draft towers may be selected in the same manner as for natural draft towers.

The cooling tower selection and application examples given here are for the purpose of explanation only and may not represent an actual requirement in your area. Tower selection should always be governed by design wet bulb temperature, tons of refrigeration required, quantity of water to be circulated, size of tower, desired temperature of the water from the tower, and temperature rise of water through the tower.

*Heating and Ventilating's Engineering Datebook, 3-25.

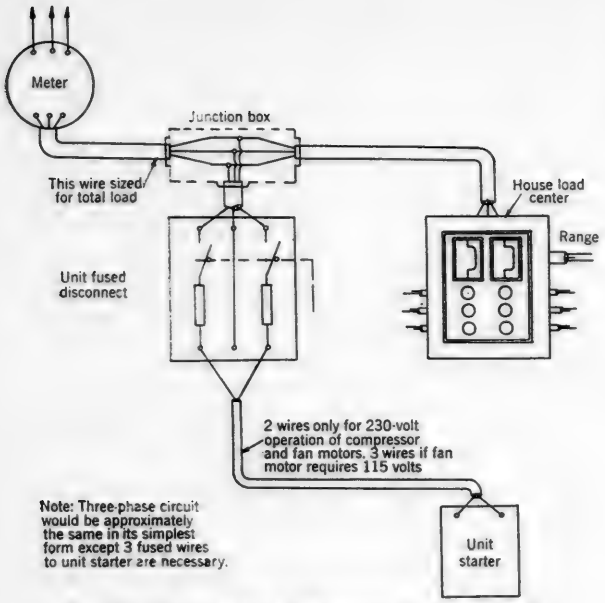

Meter
Junction box
This wire sized for total load
House load center
Range
Unit fused disconnect
2 wires only for 230-volt operation of compressor and fan motors. 3 wires if fan motor requires 115 volts
Note: Three-phase circuit would be approximately the same in its simplest form except 3 fused wires to unit starter are necessary.
Unit starter

Fig. 20. Simple single phase power circuit wiring for conditioner without furnace or water tower.

Average yearly water cost for tower operation, including blow-down, evaporation and drift, may be calculated on the basis of a loss of 3 to 5 percent of the total gpm circulated.

It is necessary to provide some means of preventing scaling, corrosion and algae formations in cooling-tower-water-cooled-condenser systems. The simplest and most successful method is by the deliberate waste of approximately one-half the amount of water normally evaporated by the tower. This is termed "blow-down". The evaporation rate is usually about 1 percent of the total circulation per 10F cooling range. "Drift" is the water which is blown out by the wind, in the case of open type towers.

Electrical Requirements

Many difficulties will be encountered in the electrical wiring of older homes. These will range from practically no wiring at all to the necessity of completely re-wiring from the street pole to the unit and the house load center.

Wiring should be thoroughly checked, considering type of service, phase, service entrance wire size and capacity, fuse and main disconnect size, and if a branch circuit presently exists for the projected conversion determine its capabilities. It is often necessary to re-wire or add wiring to handle the load.

If a job is going in on an old and well-established street, consult the power company regarding the addition of integral horsepower motors to the existing power distribution system on that street. The lines may be handling maximum, or near maximum demand, and unit starting trouble and neighborhood light dimming may occur if additional load is added without necessary modification to the power lines. It is wise to ask the advice and asistance of your power company on all jobs. This eliminates considerable trouble in wiring, in unsatisfactory installation, and in performance.

A separate, fused circuit must be employed for the apparatus installed. This should come off the service between the meter and the house service center. House load should never be run first through the air conditioner fuses and thence to house branch circuits. See Fig. 18. Neither should the air conditioner circuit be taken off the load side of the house switch or load center.

Combination heating and cooling units are usually built to require only one branch circuit, while companion operation of an air conditioner and a furnace should have one each for better control and safety, as in Fig. 19. If a water tower or air cooled condenser is used, an additional circuit must be provided. Separate circuits, properly interlocked, must be employed to protect branch circuit wiring and attached apparatus.

Wiring must comply with local, state and national codes at all times. It is assumed that a licensed electrician will be familiar with all pertinent codes and will be prepared to suggest best methods for power wiring requirements for each installation.

The power circuit shown in Figure 18 is only indicative of the best method of wiring the apparatus involved. The circuit can be made far more elaborate or much simpler. The simpler a circuit is made, the more difficult it becomes to control the equipment. Control and power circuits can be extremely simple and straight forward but each time something automatic is removed from a circuit for simplification or cost reduction, a manual operation is necessary to retain complete control. The question of what type of power circuit, therefore, becomes one of how much manual control is acceptable or how much can and will the customer spend for automatic control and first class wiring.

Control

Year-round air conditioning equipment may be installed in such a manner that every single cycle or operation is fully automatic. The owner may set his thermostats and forget the entire matter.

On the other hand, the control may be such that every operation is manual and requires a considerable amount of attention from the owner. This method is in ill favor.

There is usually a happy medium in control which will provide a minimum of manual operation that is within the means practically of everyone. Figure 19 shows such a control circuit. If the dampers are made manual the circuit becomes even less expensive yet retains most of the automatic features. In this case the owner is required to switch the dampers back and forth according to operational demand.

The circuit in Fig. 20 is basic and may be made more or less elaborate as required.

The best solution to control problems is to consult your control manufacturer for recommendations. Field representatives of control manufacturers are well qualified to assist and are always happy to lend a hand.

The value of following the electrical codes for all wiring cannot be over-emphasized. Your first-aid kit will need fewer aspirin for headaches if you refuse to be a wildcatter and a corner-cutter in electrical wiring and, for that matter, the entire air conditioning job.

Strive to make each job better than the last in every respect and one's opportunities in this rapidly growing field will increase accordingly. Aim for a reputation so highly respected by customers and potential customers that competitors cannot match it.

Flooded Coils on Closed Heating Systems

T. W. REYNOLDS

in discussing an installation of a closed system with modulated control of coils and the coils subject to flooding, data are given on why the coil floods and what is wrong with the installation. Other system arrangements are presented.

APPARENTLY because the usual hurried or brief explanation is not made clear enough for the one equally as hurried, there remain two things which seem to give the most trouble in heating work. One relates to the flooding of blast coils in closed systems when with or without modulating control of the coil. The other relates to the boiler safety loop, concerning which only brief comment will be made, because it is of little concern to the problem I am coming to, and further it is a subject that can best be treated at greater length at some other time.

Piping Problem

Fig. I shows a reader's problem as he views it. He wonders if a safety loop might be the solution. He writes:

"Water backs up in the return and coil as soon as boiler pressure goes from 2½ to 3½ lbs, even if the fan for the coil is not running, thus preventing proper circulation of steam in the coil, and consequently causing erratic control of room temperature. The duct thermostat is set at 72F and even if the steam modulating valve does not open, hot water backing up fills the lower part of the coil. This reheats the air to unbearable conditions for the office force."

Things should get worse and not better, as the correspondent seems to expect, when the modulating valve closes. However, starting with fundamentals, whenever demand (natural condensation) within the coil exceeds the supply of steam, pressure in the coil may drop to zero or even well below, so that air will not be removed, nor condensation flow back by gravity against the higher boiler pressure acting on the return, whether or not there

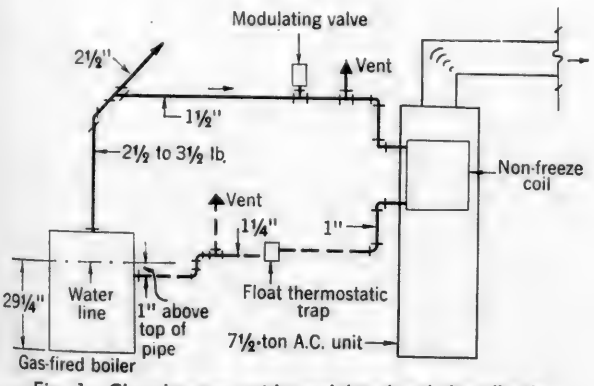


Fig. 1. Closed system with modulated coil that floods.

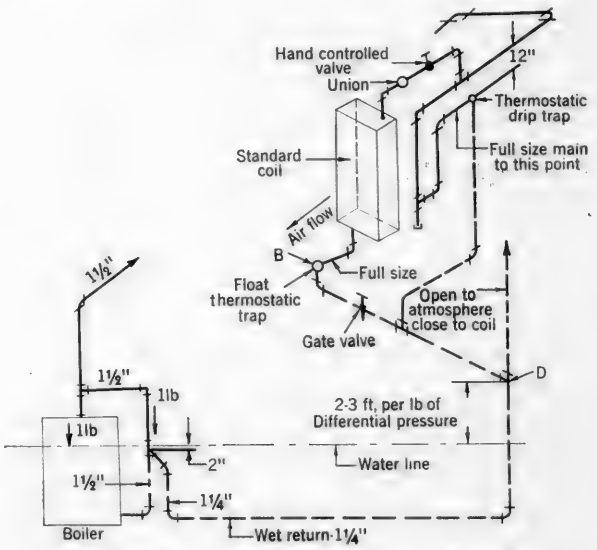


Fig. 2. Non-modulated standard vertical coil in an open circuit system.

is a boiler safety loop. Upon cold start up, the demand may temporarily exceed the boiler pick-up, particularly so if the fan is started at the same time. The greater flow at this time also increases the pressure drop to the coil. When the control valve modulates, it acts as a reducing valve to reduce pressure and thereby decreases the differential causing the coil to drain. When the valve closes, as related, vacuum in the coil will reach a maximum and there is then no steam pressure available to vent air and force condensate from the coil.

Why the Coil Floods

At the stated maximum boiler pressure of 3½ lb, there may be a steam pressure as high as 3 lb at the coil inlet, provided the coil is not far from the boiler, the coil warmed up and vented for ten minutes before the fan is started, and the fan only recirculates the air briefly thereafter. If much outdoor air is used at low

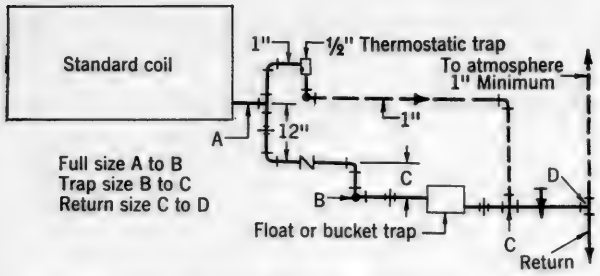


Fig. 3. Non-modulated standard horizontal coil in an open circuit system.

temperature, the pressure at the coil outlet may drop to zero, and when the control modulates or closes, the pressure throughout the coil may lower to well below zero.

Steam pressure in the boiler above its water line acts downward upon the water to force the water out through the return inlet until a column of water is formed in the vertical returns of sufficient height (therefore weight or static pressure at its base at boiler water line level) to equal the steam pressure within the boiler. Any additional head of water, and only such additional, will then be returned to the boiler.

Each pound of differential pressure between boiler and coil can be equaled or balanced by a column of water 2.31 ft high. With 3½ lb gage pressure to the boiler and zero pressure in the coil, the column of water that will stand in the returns above boiler water line will be 8 ft high, and should there be say 15 inches of vacuum in the coil (the equivalent of 7.35 lb below gage pressure), the column will be $(7.35 + 3.5) \times 2.3 = 25$ ft high.

Reduce Pressure Differential

It seems obvious from the sketch and headroom usually available that the coil is very much closer to boiler water line than either of the foregoing figures, so something must be done to reduce greatly the apparent high differential pressure possible of 3.5 lb or 10.85 lb to some reasonable difference. Installing a safety loop will not help, except possibly to protect the boiler against a too low water line, since the safety loop which applies full boiler pressure to the top of the loop to prevent water leaving the boiler also transfers that pressure to the water in the return piping to force it backward. A safety loop does not prevent water from leaving a boiler, except below the bottom inside of the pipe or nipple connecting the loop to the boiler.

Converting to Vacuum System

The best protection for both boiler and coil would be the double protection provided by a pump (a perfect check valve in itself), preferably a vacuum pump to offset any vacuum formed in the coil and thereby prevent any column build-up. In the present case, the smallest size commercial vacuum pump might be too costly and the pump operation too infrequent even when adjusted for a small discharge at each operation.

If the use of a vacuum pump is not feasible in the present case, and the coil cannot be elevated sufficiently, then the only remaining possible remedies are the avoidance of any modulation control, Figs. 2 and 3, and/or convert the closed system to an open circuit system (vented return) as illustrated, assuming that the boiler pressure can be considerably lowered if conditions are made right at the coil. Perhaps all of these things should be done since the coil appears to be at a rather low elevation.

Opening the Closed System

The open circuit system provides better removal of air and non-condensible gases and insures that the boiler pressure communicated back as far as *D* of the illustration, will not be above atmospheric pressure (zero gage pressure), but if a coil as low as shown is modulated, water may still rise to a certain extent to any point of pressure below zero in the coil or at the trap. This will reduce coil and trap capacity and possibly cause a coil freeze up when receiving considerable low temperature outdoor air, whether or not the coil is of the non-freeze type. A non-freeze coil simply means a coil designed with double tubes with condensate protected from freezing by flow in the inner tube; counter flow of steam and condensate all make for uniform temperature throughout. It can, therefore, be modulated without stratification and freeze-up, only provided, however, that it is sufficiently elevated and properly piped for venting and condensate removal.

Where high presure steam is used, it is possible to maintain a certain degree of modulation, but only where there will be a higher pressure on the up-stream side of the high pressure trap than on the down stream side. A closed gravity system cannot assure such a condition, hence a vacuum system is desirable, or an open circuit system with coil elevated enough to avoid flooding. Manufacturers' requirements for coils with closed circuit gravity systems are for the bottom of the unit to be not less than 30 inches above boiler water line and no thermostatic control to be used. Therefore, their typical piping diagrams omit any arrangement for such conditions. I

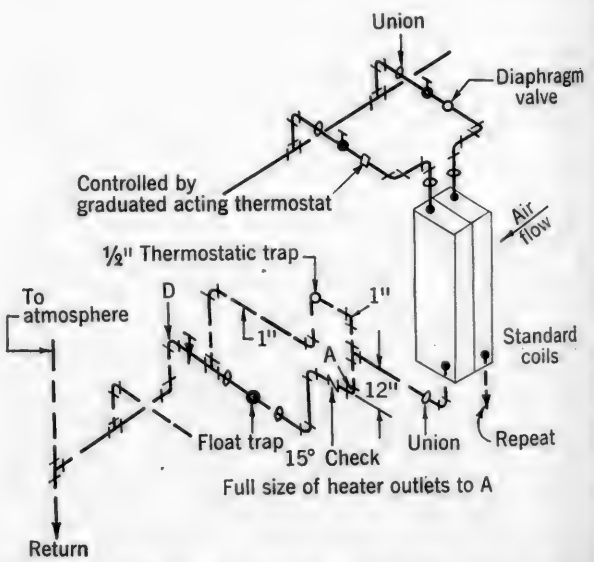


Fig. 4. Modulation with standard coils—open circuit system.

can recall when the manufacturers' guarantee was void if the coil was used with modulation on a closed system.

What's Wrong in the Installation

Commenting upon the installation of Fig. 1, the horizontal return is so near the boiler water line that back flow of water from a fluctuating boiler water line, or from high pressures, will surge and pound within it. More water will be taken from the boiler than if the return were run vertically well upwards at the boiler, or run as a horizontal dry return sufficiently elevated. None at all would be taken if it were run wet.

The vent connection will be flooded and so will the trap, probably closing at times from hot water backing up from the boiler. This vent would provide more air relief were it located on the inlet side of the trap and made of the quick vent non-vacuum type. The vacuum type cannot act to break a vacuum and also requires more pressure to be built up before it will vent. As for the trap, it serves no useful purpose in a closed gravity system while the return seems to be connected to the boiler rather close to its theoretical water line and at times will spill in above water level and interfere with steam disengagement. It should be connected to the boiler at its bottom where the water is coldest.

How Modulation Can Be Obtained

If a single coil of standard type is used and without modulation, and it should be without this, then it should be arranged as shown in Fig. 2 for a vertical coil and Fig. 3 for a horizontal coil. If there is more than one coil, and these in series, then modulation can be obtained with standard coils, although only with the reheat coil, as shown in Fig. 4. The two coils and additional space and piping requirements make this arrangement more expensive. Modulation with the non-freeze type of coil requires only a single coil, as shown in Fig. 5. With this type of coil, since the piping connections are on the same end, the coil will generally be installed horizontal. In all these sketches, the system shown is open circuit, but they can be vacuum systems by simple omitting the vent to atmosphere and substituting Fig. 6 for Fig. 5, a slightly different arrangement.

With modulation and freezing air temperatures, a single coil of the non-freeze type may be used and controlled over a wide range of temperatures with a minimum degree of stratification, difficulties, and piping. Although modulation can still be obtained with the standard

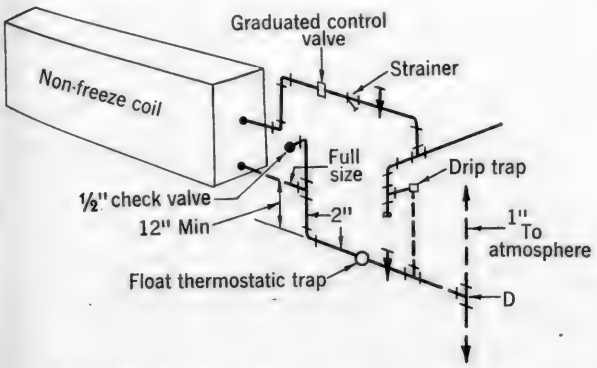


Fig. 5. Modulated non-freeze coil—open circuit system.

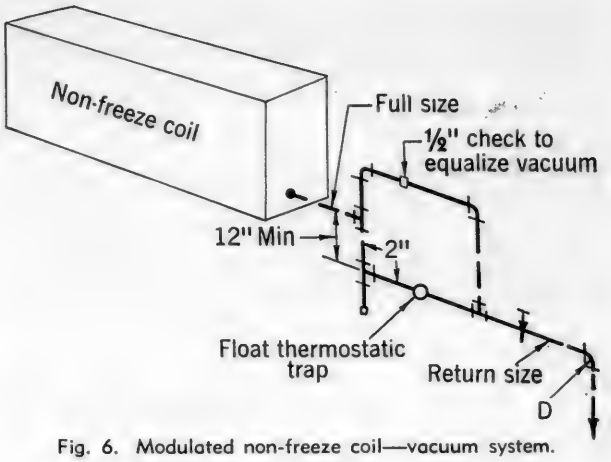


Fig. 6. Modulated non-freeze coil—vacuum system.

type of coil, there must be an additional coil in series, that is, a non-modulated tempering coil through which the air after tempering passes to a reheat coil, which coil can then be modulated. See Fig. 4.

It will be noted that the modulated coil is separately regulated by a diaphragm valve controlled by a graduated acting thermostat, while the tempering coil is conntrolled by a positive acting thermstat located in the fresh air chamber. This thermostat must be set to turn steam full on at 35 or 40F and maintain full steam pressure by a wide open valve when the entering air temperature is near or below 35F. A single hand control may be substituted on the tempering coil, provided the valve is opened wide, and full steam pressure is on all of the time.

Piping Details

All arrangements shown are for low pressure use, that is, with steam pressures below 20 lb gage. Vents to atmosphere should obviously be close to the coil and one inch minimum. A head of water before the trap, as shown, helps to insure the require pressure differential across the trap. Coil outlets should not be bushed. Strainers should be installed ahead of controls, and steam mains separately dripped as shown.

The float or bucket trap noted in Fig. 3 is not a ready remover of air at all times, so a thermostatic by-pass is provided around the trap. Although a float thermostatic trap gives good air relief and is generally adequate for condensate removal from a single coil, yet rapid venting of the coil can best be maintained by the bypass. In Fig. 5 a check valve is shown to open inward and break any vacuum in the coil by admitting atmospheric pressure when the control is modulating. In the case of Fig. 6, any vacuum in the coil when modulated is broken by the check valve in the bypass opening to admit the greater vacuum of the return.

Traps should be selected for handling 2½ times the rated condensation from the coils at the actual differential pressure across the trap, and when piped correctly, the rated becomes actual. Of course, when throttled, due attention must be given to return piping connections to insure elimination of destructive water hammer, complete drainage of the coil by gravity, and the prompt equalization of pressure in the rapidly condensing coil with the pressure in the returns, particularly when positive pressures exist in the returns.

Louis Blendermann on

PIPING

and PLUMBING

Service Hot Water for Schools

Louis Blendermann

WITH this issue, HEATING AND VENTILATING launches a new department to be of service to plumbing designers, engineers and contractors. It will discuss design information of value to these engineers in their work, it will point out good design practice, what makes some piping arrangements good, and why some other design might be considered bad.

This department will have a wide range of topics and will cover water supply, gas, fire protection systems, roof tank systems, special plumbing systems, sanitary and storm systems—to mention a few.

The approach will be practical, without any complicated mathematics or involved theory. In many cases, ready to use design tables and figures will be given, which are considered good design practice. This department is intended to be helpful and informative not only for the young engineer but for the man who has had some experience. The articles may provide a new approach or supply a new avenue for thought. Data presented are the result of years of employment as a plumbing engineer and designer with important consulting engineers, and the fruits of a keen interest in formulating design information for personal use.

As a start for this department, consideration is given to a major problem in connection with service hot water for schools. This problem has become important with the more general use of schools.

Over a period of years, the hot water requirements for a school have been steadily increasing. In the past, hot water was furnished only to the lavatories in the toilet rooms and to the slop sink on each floor. As the function and design of the school changed with the passing years, so has the hot water demand. At present considerable amounts of hot water are needed for showers, kitchens, laboratories, special classrooms and training rooms, and for other uses. This demand exists from September through June, which is the normal school year in most municipalities.

The modern school has departed from its conventional two-term use. It now functions as a community center, is used for evening and summer events, for special classes, and of course for evening adult education. This use continues through the summer months so that the school has become the accepted place for community dances, sporting events, plays, lectures and local meetings. Therefore,

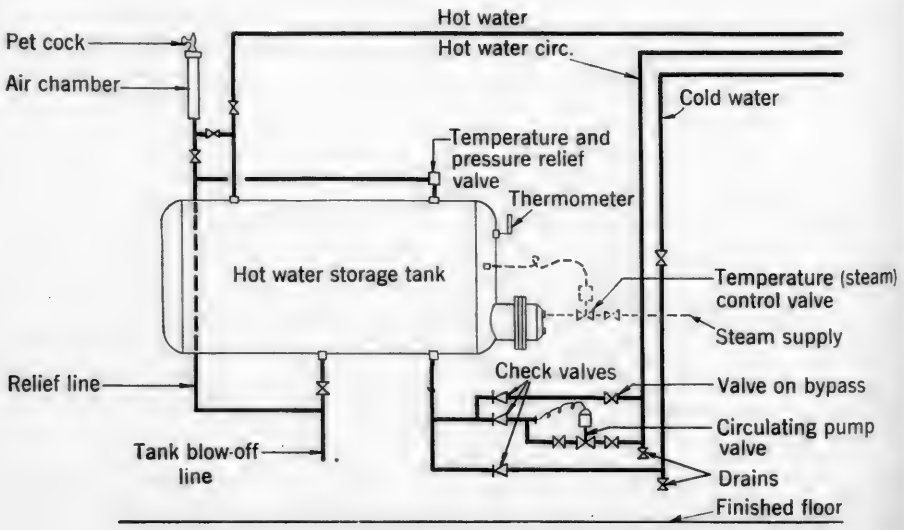


Fig. 1. Commonly used service hot water system for schools. Steam flowing through an internal coil in the storage tank generates hot water.

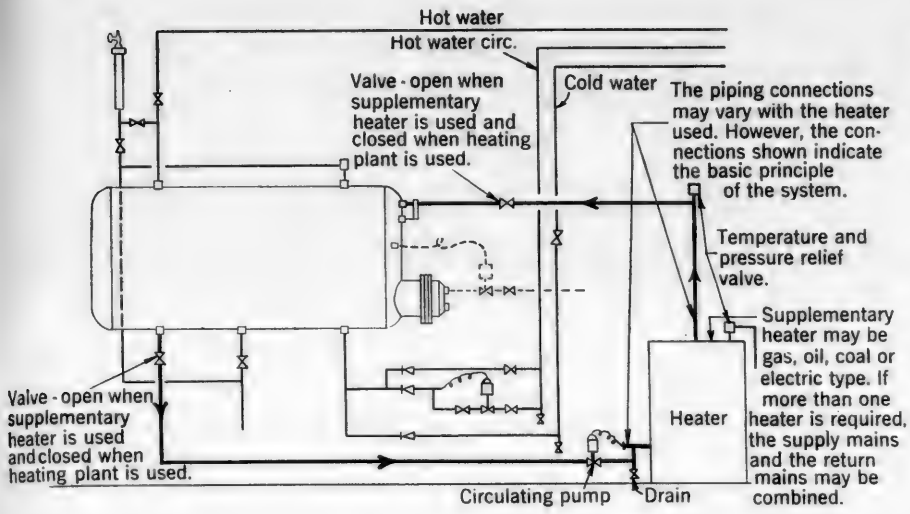

Hot water
Hot water circ.
Valve - open when supplementary heater is used and closed when heating plant is used.
Cold water
The piping connections may vary with the heater used. However, the connections shown indicate the basic principle of the system.
Temperature and pressure relief valve.
Supplementary heater may be gas, oil, coal or electric type. If more than one heater is required, the supply mains and the return mains may be combined.
Heater
Valve - open when supplementary heater is used and closed when heating plant is used.
Circulating pump
Drain

Fig. 2. A heater is added to the system shown in Fig. 1, so that the system can be used through the summer months when the space heating boiler is not used.

much thought has to be given to the year-round service hot water system to meet this general use of school facilities.

Design Factors For New Schools

Since a number of methods may be used to furnish the required amount of hot water, designers would do well to consider the following points which will govern the scope of design:

(1) Consult with the architect to obtain his prospective of the school's functions, and the amount and type of fixtures and equipment to be served with hot water.

(2) Determine, by discussion with the architect and perhaps the School Board, the contemplated use of school facilities including evenings and summer months. Any known increased activity in the near future, that will affect the system design, should be considered. It is better judgment to make plans for possible additional future needs, than to make alterations for increased capacity after a few years' operation.

(3) After the average, peak and future demand have been determined, it is necessary to design a system that will satisfy these needs in the most economical manner.

Hot Water Generation Equipment

One area favors a particular fuel over another because it is abundantly available and is, therefore, more economical to use. Fuel is important in southern zones, where it is used for the generation of hot water. It is even more important in northern areas, where it is used both for space heating and for hot water production. However, in northern areas, fuel is primarily a responsibility of the heating engineer.

Where the heating plant is used for generating hot water, then the designer can use submerged coils, indirect heaters, tankless heaters, steam connections to coils in a storage tank, or any of these units in combination. As an example, we will consider a method used in a number of schools.

In Fig. 1, which illustrates a common system, steam from the heating plant passes through the internal coils in the storage tank to generate hot water.

In most cases, it is desirable to use the heating plant for generating hot water because it is the basis for an efficient and economical method. However, in most cases the heating season used is from October to April and then the heating plant is shut down for the summer. Installation of special devices and control valves will permit the system to heat the service water without heating the building. Operation of the heating plant should be discussed with the engineer designing it.

Should the decision be to shut down the heating plant during the summer, then a separate boiler or supplementary heaters must be provided. Use of a heater, with the system of Fig. 1, is illustrated in Fig. 2. In Fig. 2, the normal piping circuit for winter operation is shown with light lines and the additional piping required so that a hot water heater may be tied in for summer use, is shown with heavy lines.

By controlling certain valves shown in Fig. 2, the system can be operated during the heating season using the heating plant for space heating and the generation of service hot water. During the summer months the supplementary heater is used in conjunction with the regular hot water storage tank. Additional economy can be achieved during the warm months by closing the hot and circulating water valves that govern supply to unused areas of the building. This will confine the hot water circulation only to the areas in use.

Existing Schools

Should increased facilities or extended activities in an existing school require a proposed alteration to the service hot water system, it is suggested that the problem be considered in the same way as for a new school.

A properly designed service hot water system will supply sufficient hot water for the school's many activities and will help the building become the center of the community's activities.

Article for Next Month

A suggested form will be described for the engineer to follow when making a plumbing survey for a building.

LONDON LETTER

Commentary on developments in Europe by our correspondent in Great Britain

COMFORT in relation to Warmth and Ventilation: The Results of Recent Studies was the title of an address given to the Institution of Heating & Ventilating Engineers recently by Dr. Thomas Bedford. So far only an extended abstract has been published *(Industrial Heating Engineer, **16**, 101*, 74). He began by summarizing the requirements for a pleasant thermal environment, saying that a room should be as cool as is compatible with comfort; that there should be adequate air movement (about 30 fpm), and that this should be variable; the relative humidity should be less than 70 percent; the walls should be warmer, rather than cooler than the air; and the air, while being free from unpleasant odors, should not be noticeably warmer at head level than near the floor.

Of the various scales of warmth that have been put forward, *effective temperature* as originally developed in the ASHVE Research Laboratory allows for air temperature, air speed and humidity, but ignores radiation. *Corrected effective temperature* is a modification which takes radiation into account. *Equivalent temperature*, introduced by Mr. Dufton at the Building Research Station of the (Government sponsored) Department of Scientific and Industrial Research, is based on radiation, air speed and temperature, but not humidity. It is given by:

$$0.522T_a + 0.478T_w - 0.01474\sqrt{V}(100 - T_a)$$

Where T_a = air temperature in deg F, T_w = MRT, and V = air velocity in fpm. For persons performing light industrial tasks in winter in Great Britain the optimum *equivalent temperature* is about 62 deg F with a comfort tolerance of 4 deg above or below. With an airspeed of 30 fpm this means an air temperature about 65 deg F. Before any reader has time to object that these figures are well below optimum, we had better anticipate and quote from Fischer (see later) who says "the most suitable comfort temperatures . . . seem to be dependent foremost on customs".

Desirable Air Movement

In a stagnant atmosphere there is a feeling of oppression, and the body is stimulated by ceaseless change. Air speeds around the feet of 40 to 50 fpm have been found to give rise to complaints of drafts. One of Dr. Bedford's colleagues at the Medical Research Council's laboratories has recently been studying the effect of mild currents of air on the face. The work is not yet complete but it appears that in a calm room maintained at 66 deg F, increase of air speed from 12 to 30 fpm is enough to produce a just-perceptible feeling of coolness.

For the measurement of air movement at low air speeds much use has hitherto been made of the *kata-thermometer*. This is certainly one of the oldest instruments for measuring comfort, having been introduced by Sir Leonard Hill. It has a large bulb containing alcohol (or mercury) and is warmed to a few degrees above blood temperature. Measurements are made by timing how long it takes to fall to a few degrees below blood temperature. It is very sensitive to loss of heat by convection and hence to air movement.

However, its use for measuring the latter is time-consuming and laborious. An instrument with a more rapid response and good accuracy even when the direction of flow varies considerably has been developed. This is the *ionic anemometer*, which in its original form consisted of a sphere 1 cm diameter plated with polonium and surrounded by two concentric cages 3 cm and 4 cm radius. The outer cage was connected to ground directly and the inner was grounded via an electrometer. The central sphere was charged to a potential of around 100 volts, and it emitted alpha-particles which ionized the air. The lower the air velocity, the more of these ions were collected on the inner cage, as shown by the electrometer. When it was suggested that there might be some risk to health with the polonium, the radio-active source was changed to radium-gold foil, and certain other modifications made. The great advantage of the instrument is that it is not heated. This means that it does not create convection currents of its own in addition to those it is intended to measure. Its quick response makes it especially valuable for the measurement of variable air speeds.

Radiant Heat, Hot and Cold Floors, and Scales of Warmth

Dr. Bedford then went on to summarize work in other fields. At the Building Research Station 145 members of the staff co-operated with Dr. Munro and Mr. Chrenko in assessing desirable wall, floor and ceiling temperatures. They preferred a high MRT and low air temperature, the experiments being made at *equivalent temperatures* of 60, 65 and 70 deg F. If the radiation is strongly directional, however, the results are not so satisfactory. With ceilings that were too hot, unpleasant sensations were experienced by the subjects even though they were unable to say that their heads were too warm. The effect seems to be largely bound up with the temperature at floor level, and in another series of experiments to compare concrete and cork floors it was concluded that the *air* temperature at floor level is an important ingredient in comfort.

When heating is by means of floor panels (in accordance with a recommendation of the Commissioners of the General Board of Health in 1857, to which nobody seems to have paid much attention until lately) the floor

must not be too warm. The highest temperature for sedentary persons is about 75 deg F, but this is relevant to an air temperature around 65 deg F and may need modifying for those who are comfortable at higher temperatures.

The question remains whether there is any demand for an instrument to measure the physiologically equivalent temperature, when it has been decided what this is. For indoor conditions in Great Britain *equivalent temperature* (which ignores humidity) is a good indication of comfort, but the *eupatheoscope* which measures it has been available for some time and is not much used. Is it not better to measure the individual thermal factors separately?

Mr. Cardiergues, Director of Costic (Paris), takes up this last point, though his paper *(Chauffage, Ventilation, Conditionnement,* ***30,*** *9,* 28) was in fact written some months before that of Dr. Bedford. There is the difficulty that these individual factors are not at all easy to measure separately. He reviews the suggested instruments and considers what it is they *do* measure.

First, the katathermometer: some years ago in Rio de Janeiro Paulo Sa correlated its readings with the subjective reactions of human observers. The correlation was not good. When the bulb was surrounded with damp gauze to take into account the evaporation loss from human skin, the correlation was worse. The present position is that an instrument originally intended to measure some sort of physiological temperature is now one of the best means of measuring air velocity!

Then there is the *Davos Frigorimeter,* much used in Switzerland. It consists of a 7.5 cm diameter sphere maintained at 97.7 deg F. The current required to maintain this temperature is measured. Tests against the much simpler *Resultant Temperature Thermometer* (see below) gave good correlation, and so there appears to be no case for the more complicated instrument. The eupatheoscope is essentially a Frigorimeter with the temperature adjusted to that which would be attained by the human skin in the particular circumstances. So to get the right answer it is almost necessary to know it in advance. In any case, comments Mr. Cadiergues, the dimensions do not appear to have been well chosen (See photo).

Photograph showing a Eupatheoscope in use. Crown copyright; published by permission of Director of Building Research.

Resultant Temperature Thermometer

He makes a plea for the more extended use of the Resultant Temperature Thermometer, which is similar to a *globe* thermometer but has a matt black globe only 10 cm diameter instead of 6 inches. It takes about 20 minutes to give a true reading; the readings need correction from a nomogram for air speeds above 20 fpm. Paulo Sa found excellent correlation (0.86) between its indications and the comfort sensations of his subjects.

Resultant Temperature, which this instrument is designed to measure, is defined by the following equation.

$$T_r = \frac{T_a\sqrt{V} + T_w}{\sqrt{V} + 1}$$

The symbols have the same meaning as before, with the not unimportant difference that the temperatures are in degrees Centigrade and V is in decimeters per second! Its disarming simplicity is lost if one converts the units to deg F and fpm, but even then it is clearly a different formula from that for *equivalent temperature.* This is seen at once by assuming still air and putting $V = 0$. Then $T_r = T_w$, and air temperature is unimportant. This raises a nice point. Only if the air temperature and that of the instrument are equal will the air be still. If there is any difference there will be convection currents set up round the globe of the thermometer and V will not be zero.

For measurement of true air temperature there is *Bargeboer's thermometer* with a bulb of only 2 mm, or one can use an ordinary thermometer in a forcibly ventilated housing. Measurement of MRT is not at all easy, and the best way is to deduce it by using two instruments, one with a blackened and the other with a highly reflective bulb. If the surface temperatures of the walls, window etc. are known, one can calculate the MRT, but in doing so one should *not* make a correction for emissivity (except for a heating panel). If one multiplies the surface area by the emissivity, the "correction" will be in the wrong direction.

Importance of Shape Factors

Even if one does know the wall temperatures, calculation of the MRT is complicated. Summing up the areas at each temperature and dividing by the total area gives, not the *mean radiation temperature* but the *mean enclosure temperature,* which may sometimes be seriously different. To obtain the true MRT, it is necessary to sum the "shape factor" multiplied by the temperature for each of the surfaces. The shape factor may be thought of as an effective surface, but actually it is "a completely geometrical number of no dimension".

The theory of shape factors has been developed especially by Dr. Kollmar of Berlin. Under the title Panel Heating, L. J. Fischer has brought together the mathematics and the principles of Kollmar's recent published works in a paper for the IHVE *(IHVE Journal,* ***21,*** *223,* 445).

It just isn't possible to do justice here to his 40 equations, 13 figures and 4 tables, but he has done a most useful job of work in making accessible some understanding of the subject for those who are not well qualified in both German and mathematics. To those

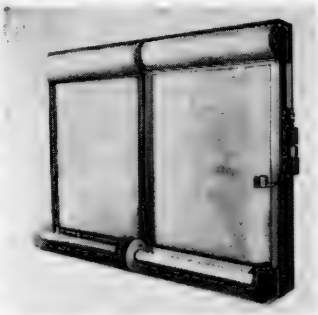
(*Concluded on page* 150)

NEWS OF EQUIPMENT AND MATERIALS

Use the prepaid postcard opposite page 136 for securing additional information on items described in this department.

Continuous Filter Screen

The automatic self-cleaning air filter of American Air Filter Co., Inc., Louisville, Ky., incorporates a new adaptation of glass fiber filtering media called Roll-O-Matic. It is designed for use in commercial and industrial ventilating and air conditioning systems to clean both outside and recirculated air. This new filter combines the simple operation and convenient maintenance of the dry type with the large dust holding capacity and higher allowable operating resistance of the viscous principle.



The filtering media is a continuous length of fiber glass material, similar to that used in AAF Amer-glas filters, except that it is supplied in rolls of approximately 70 linear ft. The material from the roll of clean media, which is mounted at the top filter casing, is transported on a continuous screen that rotates over top and bottom sprockets, down the face of the filter and is rerolled at the bottom after collecting its dust load.

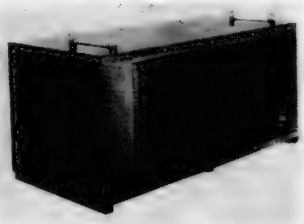
A pressure switch, sensitive to the resistance differential across the filter curtain, actuates a drive motor that rotates the screen and feeds a certain amount of clean media into the filter curtain when the resistance reaches a predetermined point.

The filter is made in vertical sections 3, 4 and 5 ft wide and in heights from 5 to 15 ft in 4-inch increments. One drive mechanism will operate from three to six sections depending upon their height. Bulletin No. 248 is available.

More information? Enter Item 1 on postcard, page 136

Water-Cooled Conditioner

The 1954 Home Coil package unit for low cost summer cooling, is announced by Hastings Air Control, Inc., Omaha, Nebr. This unit, complete with cabinet, filters, and humidity pan, attaches to any warm air furnace. It is available in three sizes for houses up to eight rooms.

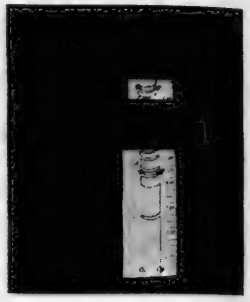


The unit operates with water up to 60 deg and makes it possible to cool without compressors at savings in initial cost up to 60 percent and maintenance and operating cost up to 50 percent.

More information? Enter Item 2 on postcard, page 136

Records Heat Plant Operation

Property managers, home owners and supervisors of heating plants can now learn much more about the efficiency of their heating systems and the quality of their fuel with either a Recorder-Totalizer or a Totalizer, two new products manufactured by Heat-Timer Corp., New York, N. Y. Either one of these instruments simplifies not only the checking of the efficiency of the heating system but also its supervision.



The Recorder-Totalizer is ideal for the absentee owner or manager of an apartment, commercial, industrial or institutional building who wants to have a continuous check on when and how his heating dollar is consumed. On a continuous tape, a permanent record shows chronologically when the heat is on or off. It indicates that the plant was in use during periods authorized by the management. One roll of recording tape will last almost a year even if the plant is in operation in summer as well as in winter.

In addition to the tape recording, the total operating time is totalized automatically in a manner similar to the mileage meter of an automobile. The time totalizer serves as an important reference to determine when the system and its components need cleaning, repair, overhaul or replacement.

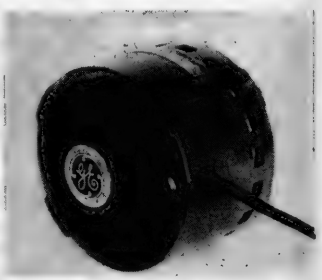
For home heating plants or small owner supervised units the Totalizer is useful and important. This precision instrument like an adding machine automatically totals the operating time of the heating system providing a ready reference for determination of quantity of fuel and efficiency of the heating system.

More information? Enter Item 3 on postcard, page 136

Heavy Duty Shaded-Pole Motor

A 5½-inch diameter shaded-pole motor, designed for heavier duty, is announced by General Electric Co., Schenectady, N. Y.

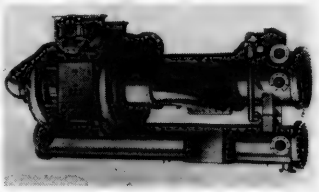
The new type KSP-39 motor is available in ratings of 1/12-, 1/10-, ⅛-, and 1/16-hp, for use on room air conditioners, furnace fans, unit heaters and coolers, window fans, and general fan and blower applications. It is an addition to the company's line of smaller shaded-pole motors, with ratings of 1.5 watts to 1/10 hp. Optional features include internal baffling, single- and double-shaft models, and resilient-base, cushion-ring, or shaft-end mounting.



More information? Enter Item 4 on postcard, page 136

Adds 3 Large Water Chillers

Three larger size CenTraVac water chillers for comfort or process air conditioning are introduced by The Trane Co., La Crosse, Wis. With the additional units the line now includes 8 sizes from 45 to 400 tons capacity.



The units incorporate a hermetic centrifugal compressor that automatically matches power consumption to load variations from 100% to 10% of compressor capacity. Power input is limited to actual cooling requirements, reducing power costs. The unit starts, stops and runs automatically with the controls interlocked for added safety.

The compressor motor is hermetically sealed inside the casing, eliminating need for shaft seals and consequent shaft seal maintenance and possible loss of refrigerant through the seal, according to maker. The compressor is direct drive type. Elimination of gear box or belt drive results in up to 5% further power savings, it is claimed.

Bulletin DS 399 is available.

More information? Enter Item 5 on postcard, page 136

Steam Traced Piping

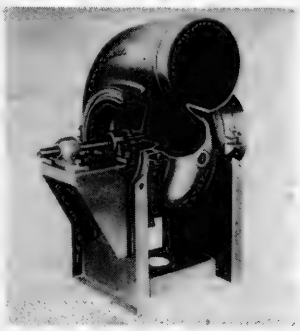
An extruded steam traced aluminum pipe, called Unitrace, is manufactured by Aluminum Co. of America, Pittsburgh, Pa., for use where sluggish chemicals such as tar and pitch or tricky solutions such as ammonium nitrate need heated lines to prevents their products from solidifying or crystallizing in the line. In contrast to normal methods of heating lines by using an external steam jacket or steam tube to apply the necessary heat, the new pipe in so produced that the steam line is an integral part of the pipe.

Extruded as a unit from the company's 3S-F aluminum alloy, the product is slightly oval in cross section because of the crescent-shaped steam passage adjacent to the product line.

More information? Enter Item 6 on postcard, page 136

Exhaust Fans Resist Corrosion

A line of corrosion resisting exhaust fans introduced by The Duriron Co., Inc., Dayton, Ohio, features all-metal resistance to corrosive fumes and gases. The casing is of Duriron, said to be one of the most corrosion resistant materials ever developed. The rotor is a multi-blade, forward curved design of Durimet 20, a high nickel stainless steel.



These Durco B Series fans are available with capacities to 8000 cfm. Design and construction make them approximately forty per cent lighter in weight, more efficient and less expensive than previous fans.

Complete construction details, dimensions, weights, and performance characteristics of the Durco Type B-124 (illustrated) are available in Bulletin F/1.

More information? Enter Item 7 on postcard, page 136

Deals With Airborne Dirt

An electronic unit, called the Electro-Staynew home precipitator, designed for the removal of airborne dust, dirt and pollen from the air, is announced by the Dollinger Corp., Rochester, N. Y. It can be installed in present warm air heating or air conditioning systems. The unit operates directly from standard a-c house current, while the power supply within the unit converts the current to the high voltage d-c necessary to operate the precipitator.

In operation, the precipitator catches airborne particles of dust and dirt much as a magnet attracts filings. Using the principle of unlike electrical charges attracting each other, it gives particles a positive charge as they enter the unit. The particles are then attracted to and held by the negatively charged collector plates. In this way the device removes dust, smoke, soot and microscopic particles from the air stream. There are no moving parts to get out of order.

Two standard models are available, one for 6 to 8 rooms, the other for 8 to 12 rooms. The cabinet is finished in grey hammertone. List prices, exclusive of installation costs, are from $495.00.

More information? Enter Item 8 on postcard, page 136

New Foot for Chair Carriers

A space saving wedge locking type foot for Zurn System installations of wall type lavatories, sinks, slabs and sterilizers in restricted or limited spaces, is announced by J. A. Zurn Mfg. Co., Plumbing Div., Erie, Pa.

The standard web-type foot supports, normally supplied as a base for the chair carriers, require a beneath-the-floor area approximately 6½ inches wide and between 15 inches and 22 inches long. This new wedge locking type foot requires only 3¾ by 4⅝ inch space, making it ideal for use where space is limited.

Built of heavy cast iron in both a medium and heavy duty type, with a Dura-coat protective finish, this new foot is designed to insure full and positive support of the fixture under all conditions.

More information? Enter Item 9 on postcard, page 136

Year Round Home Conditioner

A completely new home air conditioning unit designed for both winter heating and summer cooling in one compact unit is introduced by Worthington Corp., Harrison, N. J.

The conditioner will provide heating, cooling, humidification, filtering, dehumidification, ventilation and air circulation. Year-round control of the unit is accomplished with one point control from a handsomely styled centrally located thermostat.

Incorporating the latest developments in year-round air conditioning engineering and design, the new unit requires only 8.5 square feet of floor space and will pass through any standard 30 inch doorway.

The unit is being offered in both 2 and 3 ton sizes with either oil or gas-fired furnaces. The heating output for the oil-fired unit is 83,000 Btu per hour and for the gas-fired unit is 80,000 Btu per hour. Both oil and gas-fired units are equipped with a heat exchanger that is ceramically coated to prevent corrosion.

The gas-fired model will provide modulated heat, a new concept in gas heating. Modulated heat gives steady heating with a flame that automatically adjusts higher or lower to meet the changing heat requirements of the home. By keeping pace with the changing requirements, modulated heat maintains a steady, even warmth instead of the hot blasts and cold spots common to ordinary on-off cycle furnaces.

More information? Enter Item 10 on postcard, page 136

Metering Device For Fuel Unit

A calibrated metering adjustment for its air-oil fuel unit is announced by Sundstrand Machine Tool Co., Rockford, Ill. It gives the fuel unit built-in adjustability for the entire 0.4 to 1.5 gph firing range. To change the firing rate screw driver adjustment is made with the unit operating or stopped. A calibrated dial provided on the cover facilitates proper setting.

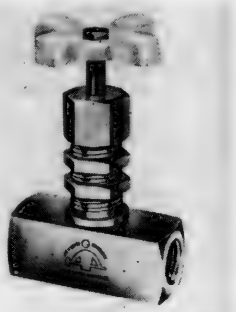
Completely contained in the end cap, this device is designed to minimize servicing. The slotted shaft and cam are cast integrally so there is only one rotating part. An O ring is used to seal the shaft against leakage. If servicing does become necessary, repairs can quickly be made by replacing the end cap.

A fixed metering arrangement is also available. With this method, individual cams are used to obtain the various firing rates.

More information? Enter Item 11 on postcard, page 136

Panel Mounted Needle Valve

An easy-to-install panel mounted needle valve, called the PM Series, has been developed by Jas. P. Marsh Corp., Skokie, Ill. According to the company, this needle valve can be quickly installed. The loosened packing nut and first holding nut are easily removed and the threaded stem guide can then be slipped through the panel opening. The first packing nut is then replaced and adjusted in relation to the second packing nut, firmly mounting the valve in the panel; assembly is completed with the addition of the packing nut and valve handle.



All needle valves of the series are designed for a maximum working pressure of 10,000 psi for use on water, oil, or gas.

More information? Enter Item 12 on postcard, page 136

Circuit Breaker Load Centers

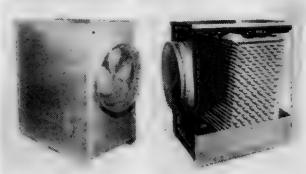
A new line of circuit breaker load centers for positive wiring protection in buildings of all sizes, from small houses to multiple dwellings and commercial buildings, is offered by Cutler-Hammer, Inc., Milwaukee, Wis.

These Unit Breakers combine thermal and magnetic trip, quick make and break, trip-free operation, ambient compensation and two position on-off lever movement. The breaker is calibrated at the factory to insure precision operation and the individual breakers are made tamper-proof by factory sealing.

More information? Enter Item 13 on postcard, page 136

Propeller-Fan Cooling Towers

A line of propeller-fan type cooling towers for residential and commercial air conditioning applications is introduced by Bush Mfg. Co., West Hartford, Conn. Available in a capacity range from 2 to 15 tons, they are constructed with Redwood fill.



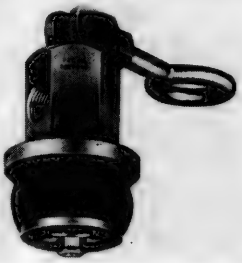
Special coatings are provided to assure all-weather protection and continued attractive appearance. Panels are zinc chromate prime coated inside and out, then rubber undercoated inside and coated outside with Vinyl-base paint of high chlorinated rubber content.

Standard motors are 110-v, single phase, 60 cycle. All motors are totally enclosed and have built-in overload protection. Motors, fans, and drives are of sufficient capacity to handle average ductwork for indoor installation. Distribution pan, top and fan guard are all easily removable for quick access to all internal parts.

More information? Enter Item 14 on postcard, page 136

Plugs for Pressure Vessels

Employing a cam-lever action to expand and draw a flanged rubber bushing against the inside wall and face of an opening, Quick-Seal test plugs and filling connectors, introduced by Mechanical Products Corp., Chicago, Ill., provide a double sealing action in split-seconds. Openings may be closed and pressure lines adapted for air or hydrostatic testing of tanks, boilers, barrels, drums, and radiators, as well as many types of cast or fabricated vessels, assemblies and pressure systems.



They are made for standard pipe openings from ¼- to 4-inch and recommended for low pressure testing. Special sizes and adaptations can be supplied.

The plugs and connectors are equally effective in all types of plain or threaded openings, including flanged, spudded or drawn openings, blind hole fittings, couplings, deep openings, and others.

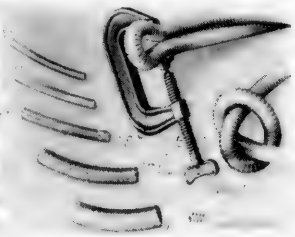
Seals on all units are adjustable for expansion and holding tension, to compensate for wear and permit the maximum pressure resistance for the type of finish in the opening to be sealed. Filling connections are tapped with standard pipe inlets for adapting pressure lines.

Catalog No. 354 is available.

More information? Enter Item 15 on postcard, page 136

Wire Reenforced Plastic Pipe

A new type of industrial piping, called Armourvin, is introduced by Newage International, Inc., New York, N. Y. It is made of translucent plastic with a 120-ton tensile helical steel wire embedded in the wall of the piping. By moulding the wire into the piping wall the wire is kept from contact with any of the liquids or gases either inside or outside of the piping.



The piping is flexible. It will bend around a 5/16-inch diameter spindle without reducing its internal bore. A ⅛-inch section has been flexed to an angle of 90 deg over 1½ million times without cracking or breaking.

Chemically inert, virtually perish-proof, the piping is tough and resistant to water, oil, grease, most acids and alkalis, diesel fuel, coal and butane gases. It will remain flexible and will withstand temperatures up to +70 deg C and as low as —40 deg C. It can be manufactured in one continuous piece, without laminations, in lengths up to two miles.

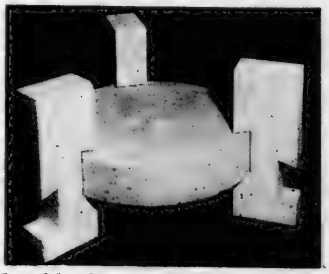
A variation of the piping, called Armorflow, is especially resistant to gasoline and other highly volatile fluids. It can handle boiling water without adverse effect. A five-ton truck has been driven over these products without obstructing the flow of fluid through them. Armorflow is fully flexible at —20 deg C and still flexible at —40 deg C and up to 150 deg C. Neither tubing will support combustion.

The piping is available in sizes ⅛- to ½-inch ID, and ⅜- to 1-inch OD.

More information? Enter Item 16 on postcard, page 136

Baffle Adjusts to 4 Heights

A baffle that reduces heat loss from combustion chambers and has a special locking feature to prevent collapse in service, has been developed by Kolb Refractories Co., Philadelphia, Pa. The new baffle, called the Heatlok, can be set at four different heights above the combustion chamber by reversing the three legs. Heights are 1-, 2½-, 3½- and 5-inch.

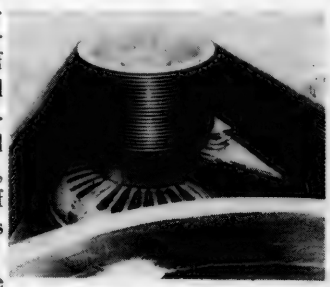


The baffle, which is made of high quality Pennsylvania flint clay, is easy to put together and adjust and is available in three disc sizes. The 10-inch size, when assembled with legs, requires 15 inches of space; the 12-inch size, 17 inches of space; the 14-inch size, 19 inches of space.

More information? Enter Item 17 on postcard, page 136

Endless Rubber Belt Drive

A new concept of power transmission, the Poly-V drive, is introduced by Manhattan Rubber Div., Raybestos-Manhattan, Inc., Passaic, N. J. It is a single, endless rubber belt with a series of Parallel V ribs molded lengthwise around the inside circumference, and has an uninterrupted, high-strength member of synthetic cords across its entire width.



The sheave grooves are designed to mate precisely with the belt ribs, and since the belt covers the full width of the drive member (not an assembly of several V-belts), the load is distributed equally over the entire driving surface. This is said to provide twice the contact area of a comparable multiple V-belt application so that the drive gives up to 50 percent greater horsepower with the same width or equal horsepower with one-third less sheave width.

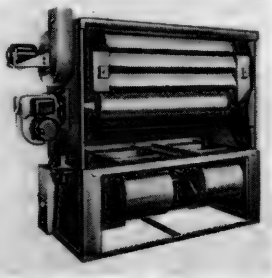
Design features of the Poly-V drive reduce face pressure one-half, giving longer life to belt and sheaves. The full drive width and the total traction surface contact prevents belt turnover and progressive sinking in sheave grooves.

One of the most important features of the new drive is that it eliminates belt matching problems common to multiple V-belt applications, and affords a marked economy in belt and sheave inventories.

More information? Enter Item 18 on postcard, page 136

New Industrial Furnaces

A new line of heavy-duty industrial furnaces is announced by Armstrong Furnace Co., Columbus, Ohio. Oil and gas-fired models rated at 350,000 and 450,000 Btu per hr output are now in production, and eventually the line will include sizes up to 1,200,000 Btu per hr output.



Ease of installation is the outstanding feature of the new industrial furnace. Each unit is shipped completely wired and assembled after having been fire-tested at the factory. Installation requires only placement of the assembled unit, providing fuel, electricity and flue, and connecting any ductwork as may be required. The furnaces may be installed vertically for air delivery upwards, or suspended for air delivery in a downward or horizontal direction.

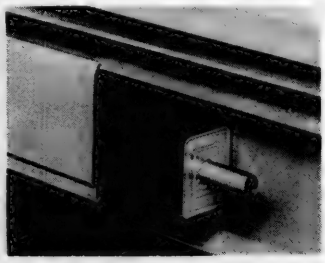
Shaping the primary combustion chamber and the secondary heat exchanger tubes like an airfoil causes the moving air to flow without turbulence. Two double-width, double-inlet centrifugal blowers on a common shaft, driven by a long-duty motor, provide air distribution over the entire heat exchanger area.

Specification sheet S-39 is available.

More information? Enter Item 19 on postcard, page 136

New Baseboard Radiation

Announcement of a complete new line of baseboard radiation is made by Heating Division of Fedders Quigan Corp., Trenton, N. J. This new series offers a complete packaged line of baseboard radiation ready for installation on the job. It is factory assembled and requires no special tools for installing.



One of the features is the vane type deflector which serves the dual purpose of a damper which provides individual control of every room, and also directs the flow of the heated air out into the room at ankle height.

Installation is simplified due to the elimination of mitering and hand-fitting of inside and outside corners as well as joining strips between sections.

Elements are available with copper tubes and aluminum fins or steel tubes and steel fins, depending on requirements of individual installations. Copper tubes are expanded so that the joining sections can be sweated together without necessity for couplings.

The radiation is available in 4, 6 and 8 foot sections, and is described in the new catalog. Output of unit has I-B-R approved ratings.

More information? Enter Item 20 on postcard, page 136

Straightens and Cuts Tubing

A compact combination machine for straightening and cutting off varying lengths of metal tubing from coiled stock is now available from Walter P. Hill, Inc., Detroit Mich. The machine will straighten and cut off nonferrous or ferrous tubing from ¼ to 1-in diameter in adjustable lengths up to 6 ft

Designed primarily as a utility, low cost, versatile machine for small lot job shop production runs, the machine features flexibility of operation and quick changeover for various tube diameters and lengths.

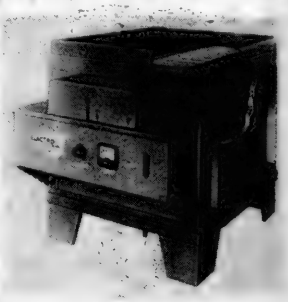
Coiled tubing up to 24-in diameter can be handled on the machine. It has hand-fed straightening rolls and a manually controlled, hydraulically fed cutoff wheel. A cutoff saw is provided for non-ferrous tubing. An optional abrasive wheel may be used for cutting off ferrous tubing.

All motors, controls and hydraulic units are in the base of the machine and accessible through removable side plates on both sides of the welded steel machine base.

More information? Enter Item 21 on postcard, page 136

Electronic Air Cleaner

The new electronic air cleaners of Electro-Air Cleaner Co., Pittsburgh, Pa., when properly sized and installed, are said to remove 90 percent of all air-borne particles as small as .001 micron.



Dirty air is pulled through an ionizing screen where particles receive a positive electric charge. Particles then pass to collecting plates to which they adhere; collecting plates are periodically sprayed with water and flushed free of contamination.

Selenium rectifiers eliminate the cost of replacement of rectifier tubes. Power consumption is small, about 30 watts for 800-cfm units, 40 watts for 1200, and about 10 more watts for each additional 1000 cfm.

The collecting plates are aluminum, lightweight but rugged. A dry-type filter is provided for use in the outlet side of the cleaner to give an even flow of air across the collection plates, keep spray out of the duct-work, and serve as a stand-by in case of power failure.

The cleaner is sized to the capacity of the furnace or air conditioning system blower. Model 108-H, for example, horizontal flow cleaner, has an 800 cfm capacity at 90 percent efficiency and measures 2 ft 4 inches high with legs, 2 ft 1½ inches wide, and 1 ft 11½ inches deep.

More information? Enter Item 22 on postcard, page 136

Choice of Compressor Unit

A new line of packaged air conditioning units presented by Typhoon Air Conditioning Co., Inc., Brooklyn, N. Y., gives the buyer the option of ordering the open type or sealed compressor unit. The choice is offered in units of 2- 3- 5- and 7½-hp. Larger packaged commercial units in 10- 15- 20- and 25-hp sizes, use only the open-type compressor.

The 2- and 3-hp models have been redesigned to fit into the same cabinet used for the 5-hp unit. This cabinet, new this year, is constructed of heavy gage furniture steel, in order to reduce vibration and noise, and to resist dents. The steel cabinet panels are formed into rigid channel and angle sections electrically welded into a compact, sturdy cabinet, and lined with acoustic and thermal insulation. One easily handled front cover simplifies service and adjustment.

More information? Enter Item 23 on postcard, page 136

A Finish for Phenolic Plastic

A material for finishing phenolic plastic based on a new concept in finishes for phenolics of particular interest to air conditioning and refrigeration manufacturers is available from Logo, Inc., Chicago, Ill., under the name of Force P-85. It uses relatively recent developments in polyester resins.

The product is said to have improved hardness and adhesion over conventional materials without resulting embrittlement even on heat aging. It is available in both pigmented and pigmented-metallic forms. The metallic coatings create effects that open new and expanded markets for inexpensive phenolic. New lines can be made of old products by use of new effects obtainable with the material, thereby saving expensive die cost.

Liquid samples and test panels of phenolic coated with this new finish are available.

More information? Enter Item 24 on postcard, page 136

Sprayed-On Heat Insulation

The formation of a new company to market a gun-sprayed fiber insulation for finishing building interiors is announced by United States Mineral Wool Co., Stanhope, N. J.

Called Columbia Acoustics and Fireproofing Co., this new firm, also located at Stanhope, N. J., will manufacture a special blend of mineral wool fibers which is easily applied to ceilings and walls in industrial, private and public buildings by spray-gun method.

The new blend forms an extremely attractive surface with high-insulating, fireproofing and sound-absorbing qualities. Its original color is white; however, it may be painted any desired color, producing very pleasing finishes.

Marketed under the trade name Cafco Spray, the new blend is applied to any clean rigid surface, such as metal, plaster, wood, poured or slab concrete, gypsum or wire lath, proves itself practical for thermal insulation, acoustical control and fireproofing of industrial, private or public buildings; thermal insulation in metal, transite and concrete buildings, boiler room ceilings, tanks and cold storage rooms; condensation control in swimming pools, dairies, laundries, ship insulation; and sound deadening in broadcasting studios, theaters, bowling alleys, and jet engine testing cells.

More information? Enter Item 25 on postcard, page 136

Trap Catches Precious Objects

A patented sanitary catch-all regulation trap that offers several important advantages is introduced by Jamaica Mfg. Co., Inc., Brooklyn, N. Y.

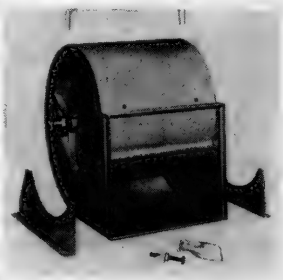
Trade marked the Pelican, the new trap is intended for jewelry manufacturers, dentists and others who work with precious metals or small objects. As shown in the illustration, there is an ingenious cup-like device into which small articles that accidentally pass down the drain may accumulate without plugging up or interfering with the normal drainage.

Illustrated literature is available.

More information? Enter Item 26 on postcard, page 136

Blower Assembly Package

A new simplified blower assembly package that reduces inventory and speeds production for manufacturers of warm air heating units and air conditioners, is available from Lau Blower Co., Dayton, Ohio. Called Series A Econo-Pak blower, the package is produced in two blower sizes with two wheel widths in each size.



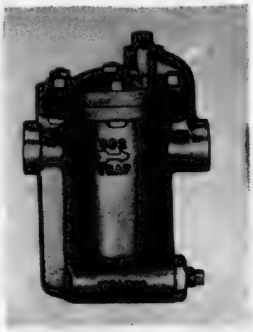
Each package consists of a Series A assembled blower, motor mount, housing supports, and hardware. Included in the price are two pulleys, which are shipped separately in bulk. The prime function of the package is to provide five different positions of air discharge and 10 variations in motor mounting with the single unit.

Five different standard pulley combinations are available with the package, providing a speed range from 385 rpm to 888 rpm. As an example of the combinations available, one A-10E blower can deliver from 800 to 1800 cfm under ½-inch static pressure.

More information? Enter Item 27 on postcard, page 136

Integral Strainer Trap

The line of integral strainer steam traps of Armstrong Machine Works, Three Rivers, Mich., has a new larger model, designated No. 882. The trap is said to cost less than a standard trap plus separate Y-type strainer, and fewer fittings are required to install it. It is recommended for use where dirt and scale conditions are bad.



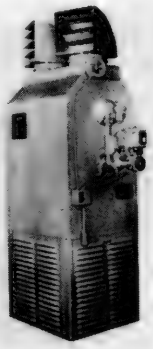
A stainless steel strainer screen is located in the body casting at the bottom of the trap. It has horizontal and opposite pipe connections of ½- or ¾-size. Capacity ranges from 1300 to 2200 lb condensate per hr. Maximum operating pressure is 250 psig. Except for the built-in strainer, the trap is identical to the company's No. 812 side inlet, side outlet trap.

The body is fine grained cast semi-steel. Internal parts are chrome steel and stainless. Overall trap height is 8 11/16 inches, diameter 5⅝ inches, and weight 15 lb. List price is $25.50.

More information? Enter Item 28 on postcard, page 136

Two Gas-Fired Warm Air Heaters

Two gas fired warm air space heaters are added to its line of Paraflo oil fired heaters by Dravo Corp., Pittsburgh, Pa. Known as the Model 20-G with a capacity of 200,000 Btu per hr and the Model 25-G with a capacity of 250,000 Btu per hr, the units are suitable for natural, manufactured or mixed gases and liquified petroleum.



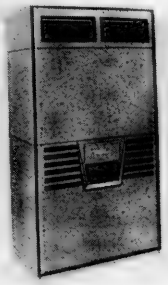
The self-contained, gun type, flange mounted gas burner has a combustion air fan driven by a ¼-hp, 110-v, 60-c, resilient-mounted motor. The burner features a positive mechanical shutoff valve operated by a centrifugal governor on the motor shaft; fool-proof pilot safety; and electrically ignited gas pilot. The air circulating fan takes in air at floor level, directs it around the combustion chamber, through the convector section and out through two 12- x 12-inch directional nozzles. The nozzles can be rotated 360 deg.

In the gas-fired heater the hot combustion gases make two passes in a stainless-steel combustion chamber before they pass through a convector section. Supporting straps hold the combustion chamber in position whether the heater is mounted vertically or horizontally, yet one end is free to move as the metal expands and contracts and stresses, and prevents buckling from expansion and contraction of the metal. Absence of refractory lining permits mounting the heater in a vertical or horizontal position or by overhead suspension.

More information? Enter Item 29 on postcard, page 136

Sectional Cooling Equipment

The 1954 line of cooling equipment of Thatcher Furnace Co., Garwood, N. J., is available in 2-, 3-, 5-, 7½-, 10- and 15-ton sizes. The complete line is designed for sectional application. This enables the dealer to have complete flexibility of installation. Separate cooling sections, blower sections, and plenum chamber sections can be installed in various combinations to take advantage of existing blower units or other favorable design conditions.



These units are available for either commercial or residential operation, depending upon the type accessories and components specified. With their two-tone maroon and grey color, they maintain the well-known colors used for many years on the company's line of heating equipment.

More information? Enter Item 30 on postcard, page 136

Air Filter Flow Indicator

An instrument designed, and manufactured by Rex Matalcraft, Indianapolis, Ind., shows the relative condition of air filtering equipment while in operation.

The instrument consists of a lightweight vane suspended on an aluminum bronze shaft. The vane is mounted at the center of the wind-tunnel. A tube extending from the wind-tunnel to the pressure side of the heating or cooling equipment is integral with the instrument. Provisions have been made to calibrate the instrument to equipment having wide ranges of initial static pressures.

The instrument is housed in a sturdy dust resistant steel case. A large window is provided in the cover to observe the operation.

More information? Enter Item 31 on postcard, page 136

Connects Pipes to Pumps Fast

A new Quick-Connect flange unit, which speeds the connection of plastic and steel pipe to the pumps of Rapidayton water systems, has been developed by the Dayton Pump and Mfg. Co., Dayton, O.

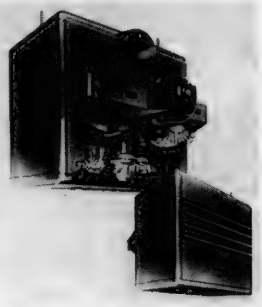
The basic unit consists of a rubber gasket, a malleable iron flange and two bolts. Steel pipes, either with or without threads, can be fastened securely to the pump merely by inserting the ends of the pipes into the flange and tightening the two bolts.

When plastic pipe is used, brass inserts are first pushed into the ends of the suction and pressure pipes before the pipes are attached to the pump. These two brass inserts, which are furnished with the pump without extra cost, provide a fool-proof hook-up in a jiffy.

More information? Enter Item 32 on postcard, page 136

Twin-Fan Gas-Fired Heater

A 250,000 Btu per hr twin-fan model is added to the line of gas-fired unit heaters manufactured by Reznor Mfg. Co., Mercer, Pa. The two fans, operating from a single heavy-duty ¼-hp motor, move 3200 cfm with an air throw of 83 ft. The smaller fans provide more effective air distribution at a much lower noise level then can be obtained with a single larger fan.



The cabinet is 36 inches wide and 24⅝ inches deep. Burner arrangement is from back to front rather than from side to side as on other of the company's heaters, and the access panel is across the back.

This 250,000 Btu per hr unit is the ninth in the company's line of suspended models, which now range from 25,000 to 250,000 Btu per hr capacities.

More information? Enter Item 33 on postcard, page 136

Commercial Air Conditioner

A self-contained high-boy air conditioner for stores, offices, and commercial and institutional buildings, is announced by United States Radiator Corp., Detroit, Mich. It is designed for remodeling old buildings, or for installation in new buildings.

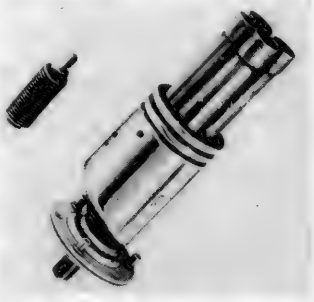
An important feature of the conditioner is that it can be used for both summer cooling and winter heating. Five sizes, 2, 3, 5, 7½, 10, and 15 tons, make it adaptable for almost any size installation by use of single or multiple units.

An adjustable grille of new type; easily replaceable filters; exceptionally quiet operation due to air acoustic insulation; and adaptability for installation either with or without air ducts, are features of the unit.

More information? Enter Item 34 on postcard, page 136

Heat Pump Reverse Flow Valve

A hermetically-sealed, manually operated four-way reverse flow valve has been developed by the Bridgeport Thermostat Div., Robertshaw-Fulton Controls Co., Bridgeport, Conn., for use in ¾- and 1-ton heat pumps of window-type air conditioning units. Installed in the heat pump, the valve acts to reverse the flow of the refrigerant, causing the appliance to throw off heated air instead of cooled air, or vice versa. It measures approximately 1⅜ x 5¾ inches, including the connecting tubes. The entire valve weighs 14 oz.

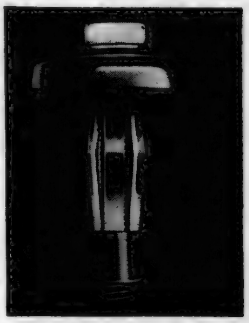


The valve is hermetically sealed and of packless construction. It contains a beryllium copper bellows (shown above valve in photo) as a packing seal.

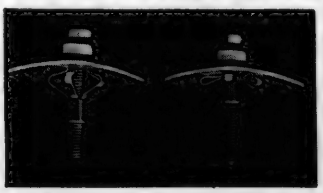
More information? Enter Item 35 on postcard, page 136

Plug Stops Pipe, Tank Leaks

The Molly utility plug which quickly and permanently stops leaks in hot water tanks, metal pipes from 1½ inches up, drums and other types of liquid containers, is a new product of Molly Corp., Reading, Pa. It can be used also as a sheet metal fastener in places where it is impossible to use a bolt and nut.



The neoprene gasket on the utility plug is not affected by steam, oil, gasoline and many chemicals. The plug expands and grips a large inside area, forming its own backing. Because of the spider backing, the Molly utility plug is comparable to using a ¼ inch bolt with a 1⅛ inch washer. It cannot cut or pull through weakened metal and withstands direct steam pressure to 225 pounds.

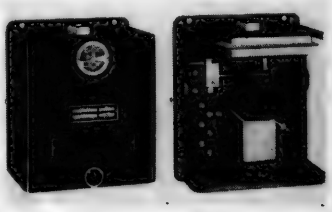


Photos show the plug (top), partially drawn up (bottom left) and in final position (bottom right).

More information? Enter Item 36 on postcard, page 136

Cut-off Protects Boilers

A new device that protects boilers in the event of mechanical or natural draft failure, and prevents nuisance shutdowns caused by momentary puffs has been developed by the Cleveland Fuel Equipment Co., Cleveland, Ohio. It replaces conventional make-or-break switches and is suitable for all firing methods and boiler types.



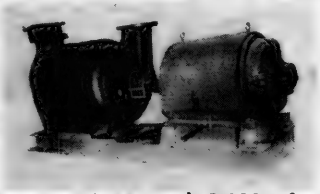
A signal light indicates momentary low draft burner puffs, as well as sustained low draft conditions. The Lo-Draft cut-off switch is designed so that the tube controlling cut-off delay operates more quickly in the warming up period.

The control is available in two units: Model LDT-A, for interruption of low voltage burner control circuit; and Model LDR-A, for line voltage interruption. A simple plug-in-relay can adapt the LDT-A for line voltage use. The hermetically-sealed unit is designed for surface mounting and can be connected to any overfire sample line.

More information? Enter Item 37 on postcard, page 136

Adaptable Production Blower

Development of a large-volume, adaptable, standard production centrifugal blower is announced by U. S. Hoffman Machinery Corp., Air Appliance Div., New York, N. Y. Using a combination of three interchangeable impellers, the No. 386 frame unit can be factory assembled to deliver any air volume between 2,000 and 9,000 cfm, with pressures ranging from 1 to 9 lb psig, or vacuum from 2 to 12 inches Hg. This is said to be the first production model available to meet any specific requirement within this range, and units can be equipped with impellers that import a non-overloading characteristic.

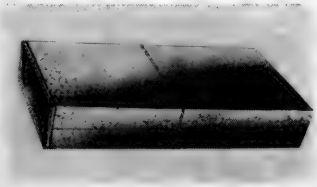


Units of the 386 series can be assembled from stock parts and tailormade to customer's needs in a matter of weeks instead of months. Previously such blowers have been custom made for individual applications, resulting in high cost and long delivery time. According to the company, the unit sells for approximately 30-50% of conventional custom models and can be delivered in ¼ to ½ the time.

More information? Enter Item 38 on postcard, page 136

One-Piece Galvanized Duct

A one-piece galvanized duct introduced by Superior Metal Fabricating Co., Niles, Ohio, is a companion piece to the company's one-piece Spee-D-Lok wall stack.



All the company's products now feature the Spee-D-Lok fastening device which consists simply of a tongue and groove. The tongue slips into the groove easily. It requires no malleting and it can be cut without damage.

The duct stays in square after it has been locked. It will not leak, corners are strong and torsion is greatly reduced.

More information? Enter Item 39 on postcard, page 136

Increased Tower Efficiency

Capacity and overall efficiency of the larger units in its cooling tower line is increased by Acme Industries, Inc., Jackson, Mich. With an average increase in efficiency of 15% over previous models, the new HACT Series towers provide a range of capacities from 20 through 70 tons. (Flow Cold tower models, 3 through 15 tons.) Larger capacity has been accomplished without increasing the compact size of the previous models and without advance in price. Improvements in eliminator efficiency and in the design of fans and fan shafts figure in the change.

Heavy-duty, all metal construction, with all sections hot-dipped galvanized after fabrication, makes the cooling towers proof against deterioration under any conditions over a long operating life. These pre-assembled, packaged units are completely piped and have motors for either indoor or outdoor service integrally mounted. Installation work and costs are minimized. The newly-designed centrifugal-type fan wheels, cadmium plated solid steel shafts and over-size ball bearings, plus the rigidity of the die-formed structural panels, make for smooth, quiet operation and a minimum of maintenance.

More information? Enter Item 40 on postcard, page 136

Four New Horizontal Furnaces

Four complete horizontal furnaces have been announced by the Certified Furnace Corporation, Trenton, N. J. The smallest model has a capacity of 80,000, the largest, 210,000 Btu per hr. The intermediate sizes are 110,000 and 160,000 Btu per hr. All models are fired with the company's flanged gun-type oil burner, and are interchangeable for use with gas, utilizing the company's inshot type gas burner.

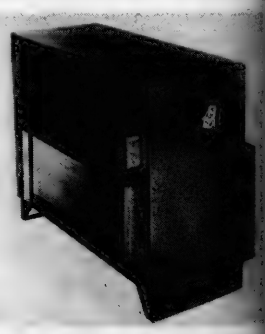
The two largest sized casing measurements are height 30 inches, width 30 inches, length 62 inches. The smaller furnaces measure length 62 inches, height 20 inches, depth 28 inches. Hanger-posts are provided for suspending these furnaces from the ceiling. Four pipe legs can be fastened to the couplings provided at the bottom, to support the furnace when set upon a base.

The model numbers, corresponding to the outputs, are SU80, SU110, SU160, and SU210. All models have built-in refractory combustion chambers, air filters, and belt-driven sirocco blowers. The units are factory assembled. The color is hammerloid blue.

More information? Enter Item 41 on postcard, page 136

Four Ton Air Conditioner

The new low-cost Cool-Pack air conditioner of Hastings Air Control, Inc., Omaha, Nebr. delivers three to four tons cooling capacity with only a 1½ hp compressor. This unit will save over 25% in first cost and up to 40% on operating cost, according to the company. It is a complete package unit with a combination water coil and Freon coil that can use water up to 70 deg temperature. An auxiliary booster blower is available for installations where the furnace blower does not deliver enough air.

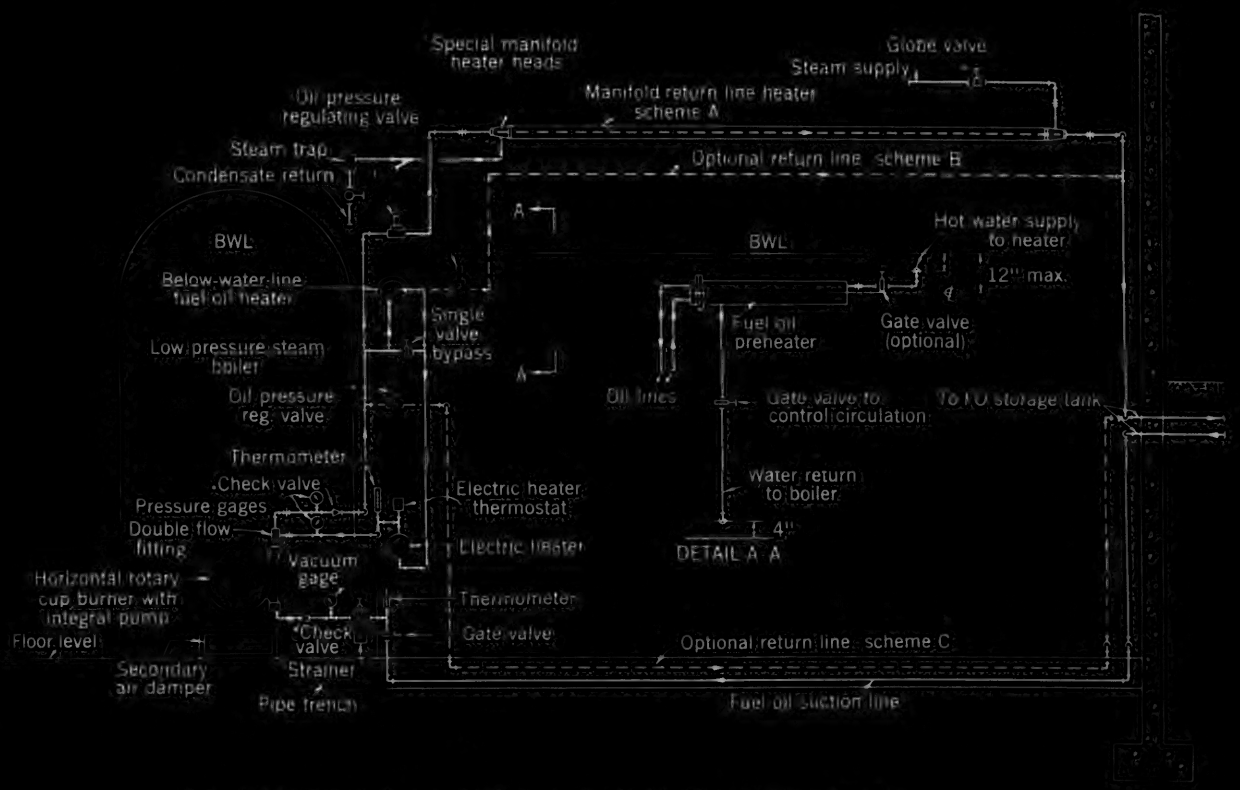


The unit is designed primarily for domestic installations, but with the addition of a blower attachment it is suitable also for business and commercial use.

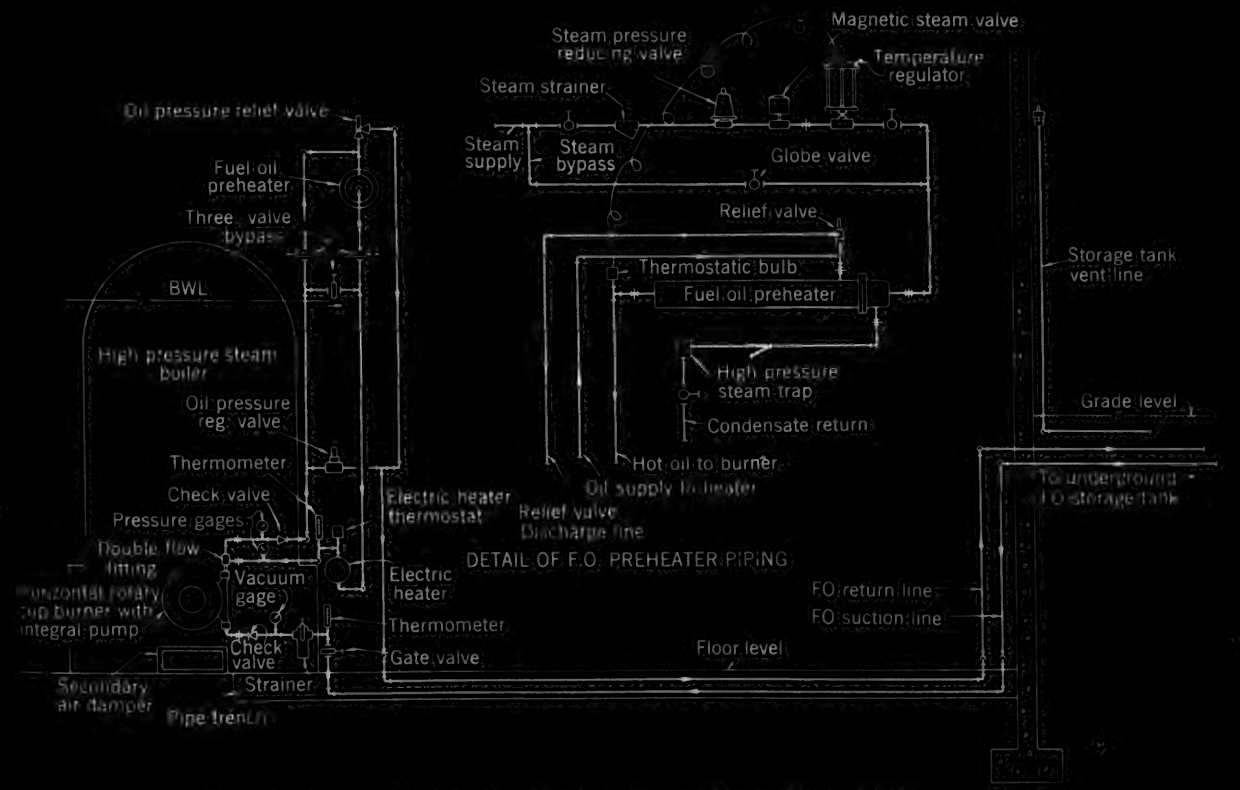
More information? Enter Item 42 on postcard, page 136

(*Continued on page* 121)

PIPING FOR FUEL OIL BURNERS



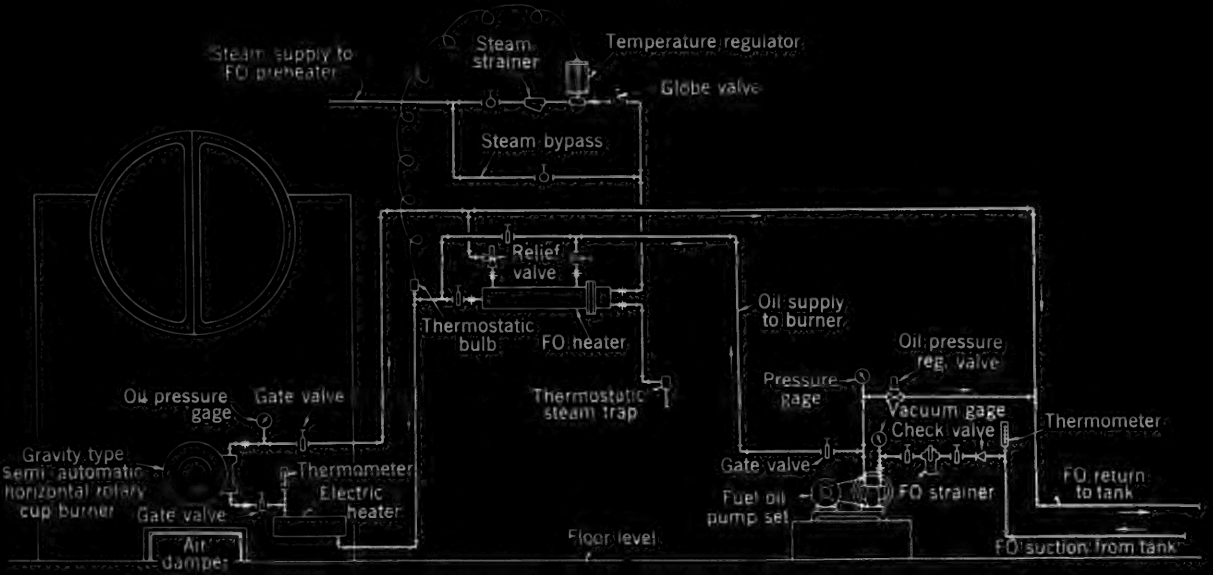
PIPING FOR BURNING BUNKER C OIL IN A LOW PRESSURE STEAM BOILER



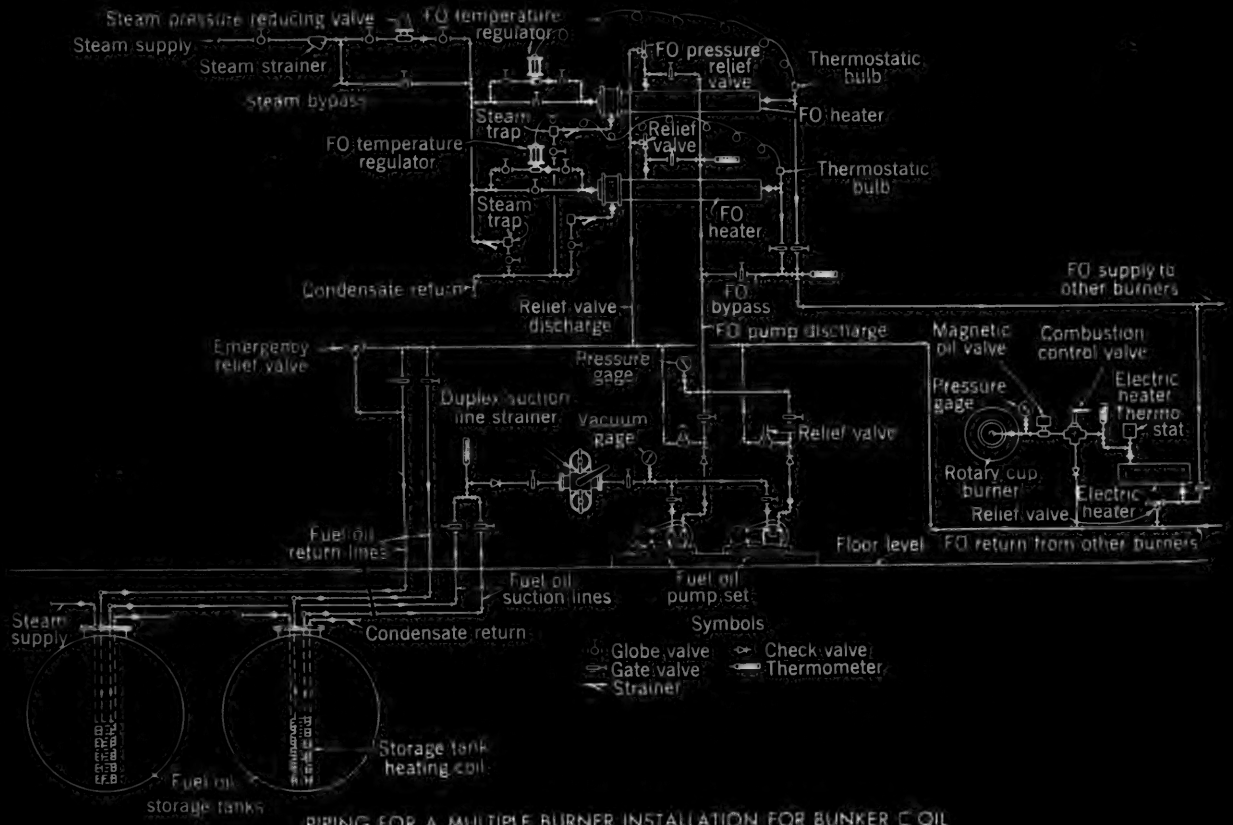
PIPING FOR BURNING BUNKER C OIL IN A HIGH PRESSURE STEAM BOILER

HEATING AND VENTILATING'S DETAIL SHEET

PIPING FOR FUEL OIL BURNERS



PIPING FOR A GRAVITY TYPE BURNER WITH A SEPARATE PUMP SET FOR BURNING BUNKER C OIL



PIPING FOR A MULTIPLE BURNER INSTALLATION FOR BUNKER C OIL

HEATING AND VENTILATING'S DETAIL SHEET

(*Continued from page* 118)

Space-Saving Blowers

Designed to fit requirements for lower-cost small furnaces and one-and-one-half and two ton air conditioning units, two new, direct-drive, space-saving blowers are introduced by Viking Air Conditioning Div., The National Radiator Co., Cleveland, Ohio.

The blowers are the D-99 and D-97. Over-all dimensions are 14¾ inches by 12¾ inches by 15½ inches high for the D-99. For the D-97, dimensions are 14¾ inches by 10⅜ inches by 15½ inches high. All dimensions are without feet.

The blowers feature the company's new off-center disc wheels, are powered with 1/6 or 1/8 hp shaded pole motors, and, although feet are not standard, the company's new Universal Lock-On feet are applicable where needed.

The off-center, disc-supported wheel is dynamically balanced. Blades are in a continuous strip, and each blade is gripped and locked by the disc at two points, giving 72 locking points between wheel and disc. Blades and end-rings are seam locked.

More information? Enter Item 43 on postcard, page 136

Activated Carbon Selector Kit

As an aid in selecting the right grade and type of activated carbon for industrial or commercial use, Barnebey-Cheney Co., Columbus, Ohio, has developed a size selector kit containing six of the most popular mesh sizes.

The samples of Adsorbite brand activated carbon range from a ¼-inch granular size to a finely divided powder. Each plastic vial holds enough carbon for adequate size selection and visual comparison of physical properties. This guides the prospective buyer in then requesting a larger sample for laboratory evaluation.

Industrial uses of activated carbon include: Air or solvent recovery, purification of gases or liquids, catalysis or catalyst support, separation, concentration or fractionation. Commercial and home uses include air freshening and odor removal.

More information? Enter Item 44 on postcard, page 136

All-Temperature Pipe Markers

An improvement in its line of self-sticking pipe markers, which makes them unaffected by extreme temperatures of the pipes to which they are applied, is announced by W. H. Brady Co., Milwaukee, Wis. The pipe markers will stick to pipes at continuous temperatures from —300 to +300 deg, intermittent temperatures to 450 deg.

They replace slow, costly hand painting and stenciling and give positive identification for only a few cents per marker. They give the specific name of the material in the pipe printed in bold, black letters on the proper ASA-specified background color.

More information? Enter Item 45 on postcard, page 136

Filter Stops Pressure Drop

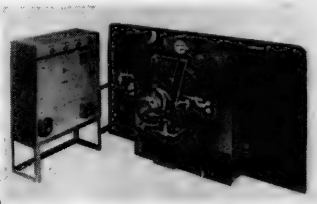
Production of a new type Dual Duty filter that prevents pressure drop in air lines as well as removing moisture and oil is announced by Airlenco, Inc., Mansfield, Ohio. This filter, when installed in an intermediate position or at the end of an extended line with a check valve, provides an adequate air supply in spots that previously were affected by a pressure drop.

The unit here pictured is 12 inches in diameter and 36 inches in length and incorporates the company's 2-inch or 1-inch filter in its construction. The outer cylinder of the filter is constructed of ¼-inch steel with ¼-inch plates welded at each end and has been tested to withstand a hydrostatic pressure of 600 lb psi. The inner cylinder, comprising the filter elements of the filter, is a steel cylinder 5 inches in diameter by 24 inches in length packed with fiberglas.

More information? Enter Item 46 on postcard, page 136

Combination Oil-Gas Burner

A gas burner assembly that can be used either as a straight gas burner or in combination with the company's Uniflow oil burner, is announced by Ace Engineering Co., Chicago, Ill.



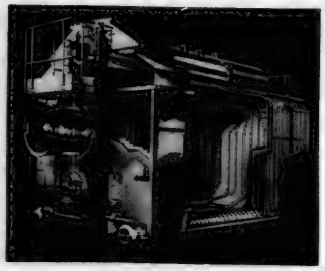
The manufacturer engineers and assembles the gas burner for the particular job and ships the unit as a complete assembly with the gas burner, combustion control mounts, and oil burner, factory installed. When mounted on a firebox-type boiler a combination oil-gas burner can be incorporated into a "Uni-Pak" assembly. Essentially the assembly consists of the factory mounting of the burner and a prefabricated panelboard to the boiler front plate. The interconnecting wiring is completed and tested at the factory. Thus the installer need only mount the boiler from plate to the boiler to complete the burner installation.

These combination oil-gas burners are available in sizes ranging from 25 to 500 boiler hp, and for use with natural or mixed gas and No. 2 through No. 6 fuel oil.

More information? Enter Item 47 on postcard, page 136

Packaged Steam Generators

Delivered by rail or truck, completely shop assembled packaged type MH water tube steam generators of Union Iron Works, Erie, Pa., can be fitted with components to meet a broad range of individualized needs for power, process or space heating.



With capacities of standard units ranging from 10,000 to 40,000 lb of steam per hr and pressures of 250 psi, even special or out-of-the-ordinary needs that formerly required field erected boilers can now be handled with MH steam generators.

High pressure MH units, usually difficult to obtain in a packaged boiler, are available. Superheaters, of the pendant or drainable type, with or without control, can be installed to meet total temperature requirements.

Furnished for pressurized oil or gas firing, or both, with fully automatic, semi-automatic or manual combustion controls, the steam generator is also readily adaptable to stoker conversion. Union heat recovery equipment, both air heaters and economizers, are supplied when required.

Bulletin MH 3-54 is available.

More information? Enter Item 48 on postcard, page 136

Non-Chemical Boiler Cleaning

Boiler-Cleaning colloidal formulas, known as Series 31-H, that dissolve scale and corrosion, oil and grease and hold resulting solid particles in suspension for removal by blow down are introduced by Water Treatment Co. of America, Pittsburgh, Pa. Mud and sludge are carried off by this method rather than deposited, and normal boiler operation is not disturbed. Most boilers can be cleaned thoroughly in from 30 to 40 days.

The formulas blend with the boiler water and clean wherever the boiler water or steam travels. This includes the entire steam side and system and return. Other methods are not required with its use.

More information? Enter Item 49 on postcard, page 136

New Polyphase Motors

A new line of Series 100 re-rated polyphase a.c. motors in the 1 to 30 hp class is announced by Howell Electric Motors Co., Howell, Mich. The motors are built to new frame-size to horsepower standards set by NEMA. They are smaller and lighter than present motors. In some models the horsepower is actually double that formerly available in frames of the same size.

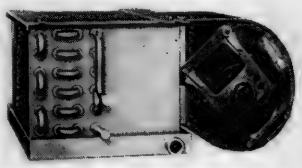
Frames are made of rolled steel, and end plates are of cast iron. This makes an extremely rigid structure. Also, by using rolled steel there is more space for windings. Nearly 50% more contact area between cooling air and active materials assures maximum ventilation. Time-tested copper rotor construction has been retained.

The first motors offered in the new Series 100 line are (1) open, drip-proof motors (left photo) and (2) totally enclosed, fan-cooled motors (right). Both types are available in 182 and 184 frame sizes, rated at: 1, 1½ and 2 hp at 1800 rpm; 1½, 2 and 3 hp at 3600 rpm; and ¾, 1 1½ at 1200 rpm.

More information? Enter Item 50 on postcard, page 136

Year Round Air Conditioner

The Spotaire 900, an individual room, built-in, air conditioner designed especially for rooms with low ceilings and other space limitations, is announced by Drayer-Hanson, Inc., Los Angeles, Calif.



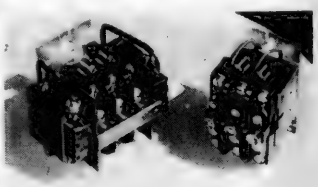
This new model is only 11¾ inches high, including an insulated cabinet; the basic unit is also available without the cabinet. It heats, cools, ventilates, filters, and dehumidifies, providing air-conditioning all year long. It can be controlled with a flick of a switch, or by a thermostat, conditioning only the area being used. It is easy to install, requiring little or no duct work, and is silent in operation.

The new model features a motor control which is flush with the outside of the cabinet, for quicker installation: piping connections brought directly to the outside of the unit; a side drain; and a removable lower panel, for easier servicing.

More information? Enter Item 51 on postcard, page 136

Starters and Contactors

A new line of magnetic, across-the-line starters and contactors designed specifically for the air conditioning and refrigeration industries is offered by The Arrow-Hart & Hegeman Electric Co., Hartford, Conn. To provide the special tripping characteristics required by hermetically sealed motors for protection against burnout, the controls can be equipped with Type QT quick trip heaters. These quick trip heaters and standard heaters fit standard overload relays and require no special equipment such as spindles or non-standard relays.



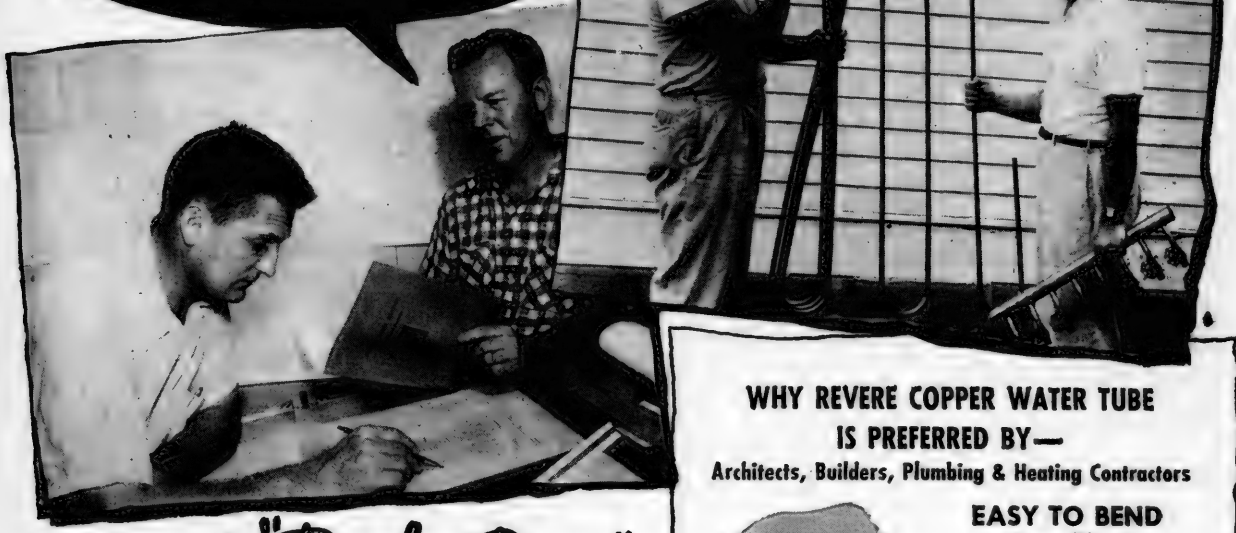
Since the rating of 30 amperes at 300 v max ac only, covers all compressors to approximately 8 tons capacity, the manufacturer points out that one size of control will cover practically all installation needs.

More information? Enter Item 52 on postcard, page 136

(*Concluded on page* 124)

"THE MANY DESIRABLE CHARACTERISTICS OF REVERE COPPER WATER TUBE MAKE IT THE IDEAL MATERIAL FOR RADIANT PANEL HEATING"

"PREFABRICATION IS EASIER, TOO, SAVES TIME AND LABOR ON THE JOB"



... say the "Bagley Boys"

OF ROBERTSON, MO.

Directly above you see Mr. Eble, Chief Design Engineer (left) and Mr. R. Bagley conferring on a radiant panel heating job. Says Mr. Bagley, "Because of the superiority of radiant panel heating we recommend it every chance we get. We must give copper the credit for putting radiant panel heating on a competitive basis with inferior methods of heating, because of its many outstanding features. As it has been pointed out many times: 'There is not another metal or alloy that has *all* the desirable construction characteristics of copper.' Why shouldn't we prefer it?"

At top right, Mr. R. W. Hardy holds a preformed radiant panel heating coil assisted by Mr. Harry Smith who has a prefabricated distribution manifold in his hand. Says Mr. Smith, "One answer to keeping radiant panel heating costs down is prefabrication. That's why we prefer Revere Copper Water Tube: It is ideally suited to preforming and the techniques used to install radiant panel heating."

It's good advice the "Bagley Boys" offer. Use Revere Copper Water Tube for radiant panel heating, hot and cold water lines, underground service lines, air conditioning and processing lines, waste stack and vent lines. There is a Revere Distributor near you who carries a full supply of Revere Copper Water Tube in various sizes and tempers. And if you have technical problems, he will put you in touch with Revere's Technical Advisory Service.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere.

SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS

WHY REVERE COPPER WATER TUBE IS PREFERRED BY—

Architects, Builders, Plumbing & Heating Contractors

EASY TO BEND

Saves Time

Revere Copper Water Tube is easy to bend. Soft temper can be bent by hand to meet installation conditions.

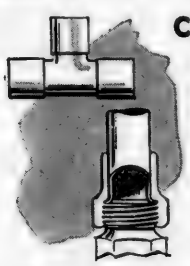
HANDY LENGTHS

Save Fittings... Labor

Revere Copper Water Tube comes in straight lengths of 20' in hard and soft tempers. 60' coils of soft temper reduce the number of fittings needed.

SOLDER OR COMPRESSION FITTINGS

Need Less Work Room ... Save Metal



No worry about wrench room when you use Revere Copper Water Tube with solder fittings. Compression fittings can also be used. No threading is necessary with either type fitting. Wall thickness of tube used can thus be less than for threaded pipe.

NON-RUSTING

Rustable pipe eventually clogs as shown in drawing at top right. Non-rustable Revere Copper Water Tube suffers no loss of flow or pressure as shown at bottom right. No allowance in pipe size need be made for rust accumulation with Revere Copper Water Tube.

(*Concluded from page* 122)

Flexible Tubing Easy to Install

Thermaflex A branch ducts for high and low pressure air conditioning systems have been introduced by Flexible Tubing Corp., Guilford, Conn. The duct is flexible, light in weight and combines low air friction loss with ease of installation.

Basic construction of the tubing is a continuous galvanized spring steel helix covered with a permanently bonded three-ply laminate of Fiberglas fabric sandwiched between two layers of aluminum sheeting. The aluminum is bonded to the fabric with a specially-developed resinous elastomeric compound which also binds the aluminum to the wire helix.

Available in 12 ft lengths and diameters of 2 to 10 inches, the duct is flameproof and will withstand a hydrostatic pressure of 59 psi. It will function within a temperature range of zero to 250 F. This tube has been under development for three years.

The tube can be cut to size on the job by making a cut midway between the wire coils and then using a wire cutter to clip the spring steel wire as shown.

More information? Enter Item 53 on postcard, page 136

Ultraviolet Gas Analyzer

The Vapormaster, a portable ultraviolet analyzer for measuring minute quantities of gas in air, is offered by Manufacturers Engineering and Equipment Corp., Hatboro, Pa.

The Vapormaster has a full scale absorbance of 0.0025 on the most sensitive range. As a result, it can detect a few parts per billion of such substances as napthalene, ozone, benzaldahyde, nitrobenzene, bromine, sulphur dioxide, and benzene, to name just a few. It detects less than one-twentieth of the toxic concentration of many substances.

The device detects the presence of gas by the absorption method of ultraviolet light. When the air being tested comes in contact with the ultraviolet beam of the instrument, the reduction in the intensity of the ultraviolet light determines the concentration of gas present in the air. The degree of gas concentration is registered automatically on the dial.

More information? Enter Item 54 on postcard, page 136

Finned Radiation

Finned radiation, both non-ferrous and steel, for steam and hot water heating applications in industrial, commercial and institutional buildings is added to the Herman Nelson heating and ventilating line of American Air Filter Co., Inc., Louisville, Ky.

Both rigidity and heat transfer efficiency are increased by the new finger design employed both in the non-ferrous radiation, which has aluminum fins on copper tubes, and the steel radiation. Interlocking tabs, punched at the corners of the fins, are said to increase the rigidity of the elements and add to the heating efficiency by creating more turbulence in the air flow.

The finned radiation, available with flat top, slant top or grille covers, is offered in 6-inch increments, 2- to 12-ft lengths. The 18-gage steel covers can be supplied for 1, 2 or 3 rows of elements. End closures, joiners and corners are also available. Tubing can have either plain, threaded or welded ends.

More information? Enter Item 55 on postcard, page 136

Tubeless Boiler-Burner

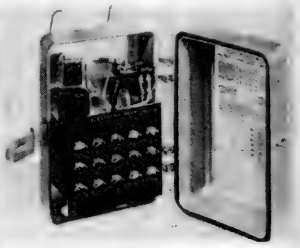
The new Korth Thermo-Flo steel boiler-burner units of Eckhart Mfg. Co., Union, N. J., has an instantaneous hot water coil of high capacity. The extra large combustion compartment allows full expansion of flame and gases with large radiant heat absorbing surfaces. The chamber is built-in and is made of instant heating refractory material.

Five separate serpentine flue passes in each size unit allow for higher absorption of heat from remaining hot gases. All flue travel points in the boiler are accessible. The round stack outlet is an integral part of the boiler.

More information? Enter Item 56 on postcard, page 136

Electronic Level Control

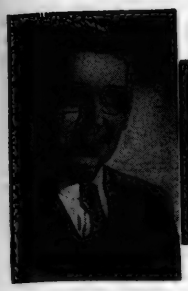
Level Control Type 13DJ3 introduced by Photoswitch, Inc., Cambridge, Mass., controls the level of all electrically conductive liquids. The control consists of an electron tube amplifier and relay combination that operates from minute currents in the probe circuit.



Except for annual replacement of a long-life electron tube, the control is maintenance-free, because there are no floats or stuffing boxes to wear or fail in operation. Contact with the liquid is made only by corrosion resistant, stainless steel probe rods. Accuracy is independent of temperature or pressure.

A single control, through flexible terminal panel connections, provides for operation as either a pump-up or pump-down control, or a high or low safeguard with fail-safe action for all five types of operation.

More information? Enter Item 57 on postcard, page 136



Experience is my Classroom

By T. W. REYNOLDS

• SMALLER WATER PIPES CUT LOSSES

Water piping is a field where reduction in pipe size provides additional and special advantages. For example, few realize that pipe diameter is a contributing factor to water hammer. This is because larger pipe diameters contain more weight of water to arrest and have relatively less friction compared to the weight of water. Of course, the larger the pipes are in a hot water heating system, the more the time required for draining, refill, venting, heating up and cooling off.

In general, domestic hot water supply should preferably be piped in direct individual runs of small pipe, say one to each bathroom and one to the kitchen. The usual practice has been to run a one inch main to the kitchen and take branches from this main to the other locations. Such a system can easily contain two gallons of water which, after fixture use has stopped, is wastefully left there to cool. If instead ⅜ and ½ inch direct runs of copper pipe were used, there would be less than one gallon of water cooled off and wasted. This also means less time before hot water can be drawn at the faucets.

The rate of heat emission per square foot of external surface decreases slightly as the pipe size increases, but the rate of heat loss per lineal foot of the pipe increases because the amount of heat losing surface has been increased. Notwithstanding this greater heat loss, the larger pipe takes longer to cool off due to the larger quantity of heat stored in the greater weight of water and metal of the pipes.

Due, then, to this lower rate of temperature drop, there will be less motive head for water to circulate in the pipe, but this is more than compensated for by the lessened resistance per pound of water circulated. The total friction surface in the larger pipe is greater, but the volume of water content has increased at a much greater rate. Therefore, because of the greater influence of some of these factors, the larger the pipe, the higher the water temperature that will be maintained, the greater the rate of heat loss, and the greater the amount of heat and water wasted to obtain hot water once the pipe has cooled down and the cold water drained.

The quantity of cooled water withdrawn and wasted from a larger pipe depends upon the frequency of use. This may, in some cases, be no more than in a smaller line. After a lapse of time in the use of water, the water in a small line might have to be fully wasted due to quicker cooling to lower temperatures, but the water in the larger pipe may still be not too low in temperature.

• HOT WATER PROBLEM

A sketch, Fig. 1, was presented to me accompanied only by the brief sentence, "What's wrong with it?" I can find nothing wrong with the layout, although it can be improved slightly by additions I have made, such as a by-pass around the mixing valve, stop valve *A*, and a check valve at *B* to prevent any possible reverse flow. The stop valve permits regulation of cold water flow to the mixing valve and the bypass is necessary should the mixing valve become temporarily out of order, or 180F water be required where requirements are now 140F. The mixing valve should have a minimum seal of 8 inches, since it works better that way and the valve is not so apt to hunt. This valve can be brought down to side of tank if no room above tank. I have also indicated an alternative cold water supply.

Fig. 2 shows an arrangement I prefer, mainly because the stored water is kept down to a temperature where tank corrosion and radiation losses will be greatly reduced. One other and important advantage is that the tankless coil receives only stored preheated water, thus reducing the load on the coil and therefore the boiler capacity otherwise required.

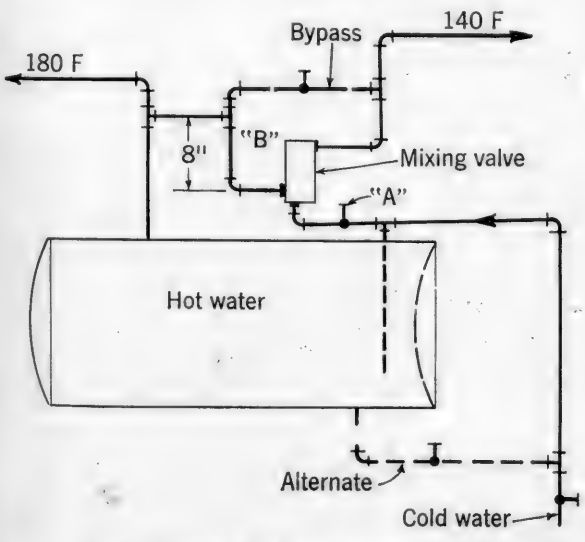


Fig. 1. Hookup of original installation.

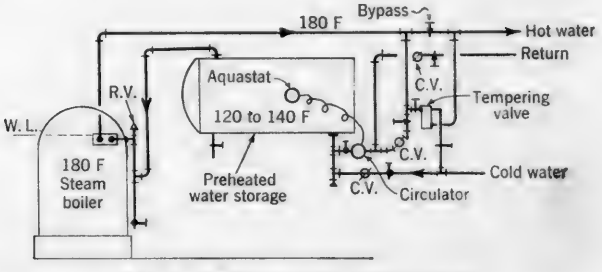


Fig. 2. Preferred piping arrangement.

How Honeywell Customized Temperature Control helps you

Give your clients better working weather

Why Honeywell Customized Temperature Control is becoming a "must" in all types of buildings

THE importance of good "working weather" *inside* a building is coming to be appreciated by a growing number of people concerned with promoting efficiency and satisfaction in all types of buildings.

A case in point, which tells how to insure proper indoor weather, is the Emmie U. Ellis Junior High School in Elgin, Illinois.

Today—as demonstrated by the Ellis school—the best way to provide proper temperature control is through the use of *Honeywell Customized Temperature Control.*

The key word here is "customized." It means that whatever your clients' control requirements, a Honeywell Customized Temperature Control installation *designed to fit the needs of the building and its occupants is your answer.* This applies not only to heating and cooling, ventilating and humidity control but to industrial control as well.

Only Honeywell can provide true "customized" control. Because only Honeywell manufactures all three types of controls—pneumatic, electric and electronic.

The story, in brief form, of the Honeywell Customized Temperature Control installation in the Ellis Junior High School is told here.

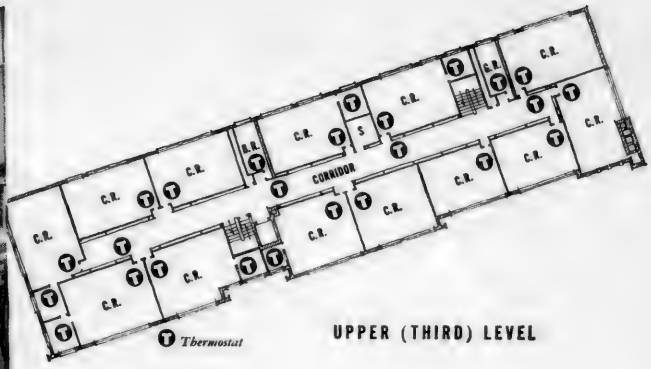
The *techniques* used, applied to your particular problems, can help you give your clients the indoor weather they've always wanted—in any type of building.

The Emmie U. Ellis Junior High School, Elgin, Illinois. Architects and engineers: Elmer Gylleck & Associates; Heating contractor: A. J. Ironsides.

Exposure and occupancy factors are the big control problems in the library. The room has large glass areas facing east which admit a good deal of solar heat on sunny mornings. One minute the library may contain five students, the next—fifty. These problems are easily solved, however, by several Honeywell thermostats placed strategically around the room.

The "use" comfort factor is the biggest problem in the home economics room. When the ranges go on they go on all at once—adding a great amount of extra heat to the room. Ordinarily this would mean real discomfort. But with Honeywell thermostats on the job controlling the heating and ventilating system, home economics students remain comfortable all the time.

Still another "use" problem must be met in the woodworking shop. Students here are physically quite active, need lower room temperatures for comfort. This condition is met handily by the Honeywell Customized Temperature Control installation. Individual thermostats here control space heaters—giving just the right indoor weather for work.



UPPER (THIRD) LEVEL

For comfortable, even temperature in new or existing buildings— of any size—specify Honeywell Customized Temperature Control

Whether it's a school, shopping center, factory, office, motel, hospital—or any size building—new or existing, Honeywell Customized Temperature Control can help meet your clients' heating, ventilating, air conditioning and industrial control problems.

Your clients will not only enjoy more comfort and efficiency, they'll save fuel, too.

For full facts on Honeywell Customized Temperature Control, call your local Honeywell office. Or mail the coupon today.

Orrin Thompson, superintendent of schools, Elgin, Ill., says:

"The Ellis school, like most of the schools in Elgin, is a better place to work and learn because it's a comfortable school. Honeywell Customized Temperature Control certainly deserves credit for helping to make it that way."

MINNEAPOLIS **Honeywell**

First in Controls

112 OFFICES ACROSS THE NATION

Minneapolis-Honeywell Regulator Co.
Dept. HV-6-118, Minneapolis 8, Minnesota
Gentlemen:
I'm interested in learning more about Honeywell Customized Temperature Control.

Name .....

Firm Name .....

Address .....

City ..... *Zone* ..... *State* .....

What Would You Do?

Replies to engineering and operating problems of interest to the industrial plant engineer

Conducted by
NATHAN N. WOLPERT
Associate Editor

SNOW melting systems have proven of value, not only in business areas, but also at industrial plants. Therefore, information presented in the current discussion should interest a large number of plant engineers.

Should you have a problem that you would like to see discussed in this department, or if you have some comments that you would like to add to the problem to be discussed in the next issue, you are invited to write to the Editor.

This Month's Problem

We plan to install a snow melting system for a driveway 50 ft long that leads to a loading platform. A steam supply is available for the heating. What should be the heat output for this system and how should the pipe be installed to provide good operation? How should the steam converter be piped?

This Month's Problem

The piping for a steam converter used in connection with a snow melting system is shown in Fig. 1. A 30 per cent glycol solution leaving the converter at 140F can be used as the heating medium to be circulated by a 1½-inch standard circulating pump. In the figure, note the balancing cocks located on the return line before it is connected to the return header. These cocks are used to regulate the flow of the heating fluid through each coil.

As a preparation for a snow melting system similar to the one that your reader plans to install, a 6-inch crushed stone base was used and then concrete chairs about 4 inches wide were poured across the area, spaced 4 ft between centers illustrated in Fig. 2. These chairs extended two inches above the crushed stone and were intended to support the reinforcing mesh and the snow melting coils. The mesh was then installed with the heating coils lying on top.

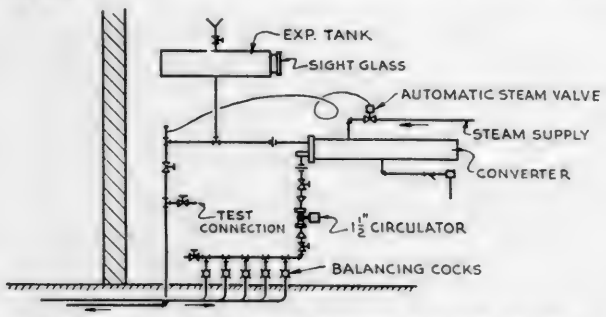


Fig. 1. Piping for a steam converter installed as part of a snow melting system.

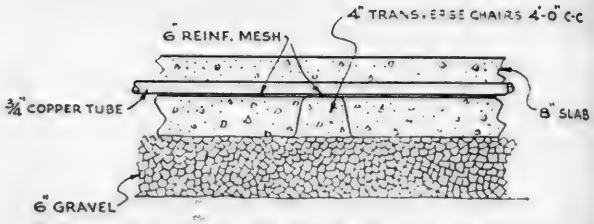


Fig. 2. Longitudinal section through concrete.

Before the concrete was poured and before any water was let into the system, an air test under 50 psi pressure was applied for 24 hours to help locate any leaks that might develop in the system. After all piping connections were made and the pressure test proved that there were no leaks, the 8-inch concrete slab was poured over the area and the snow melting system was complete and ready to be placed in service.

The generally accepted design for most snow melting systems is a heat output of approximately 100 Btu per hr per sq ft of melting area to melt one inch of snowfall an hour.

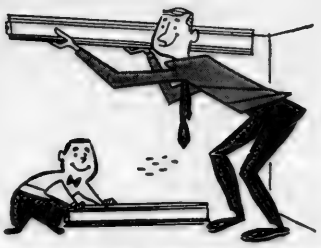
Type K soft temper copper water tube to form a sinuous pattern is used. Copper tube is furnished in coiled 60 ft lengths, and to facilitate keeping the tube straight when it is uncoiled, here is a simple method. Nail two lengths of wood strip on a plank spaced wide enough to accomodate the O.D. diameter of copper tube. With the tube fed through the space between the strips, the coil is laid straight without kinks.

According to the U. S. Department of Commerce Report BMS 58, soft solder joints, when properly made, are perfectly satisfactory for applications of this kind. Therefore, joints were made with 50-50 lead-tin solder.

John E. Ziegler
Pacific Coast Division,
Revere Copper and Brass Incorporated
Los Angeles, Calif.

Problem for the Coming Issue

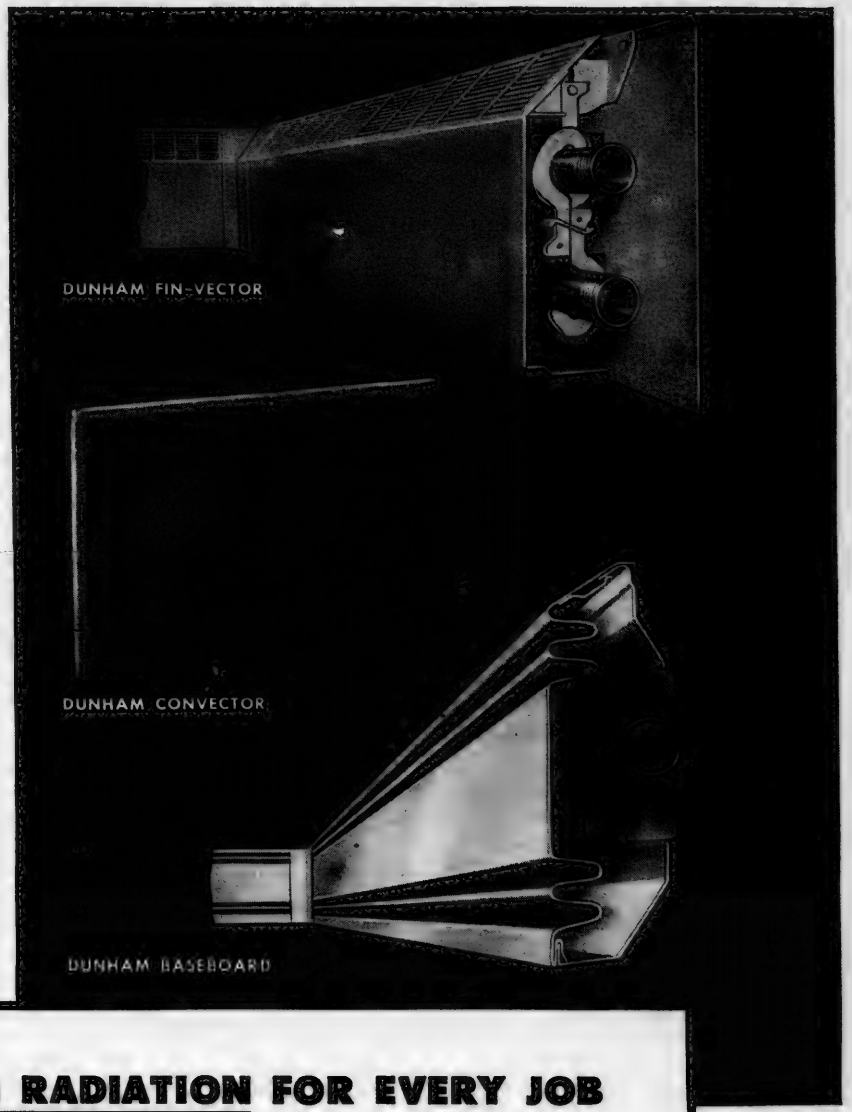
We have some 1½-inch diameter high-nickel alloy pipe that we would like to form with medium radius bends. As we do not have the necessary heating furnace for making hot bends, can you please tell me how such bends can be made with cold pipe and a filler?



"Light weight—can be suspended at *any level* along wall"

"Easy-to-turn damper knob in reinforced, one-piece front"

"Fits flush with the floor—no 'cleaning under' problem"



EVERYTHING IN RADIATION FOR EVERY JOB ...FROM THE COMPLETE DUNHAM LINE

Here's As Complete A Line of radiation as you can get . . . *anywhere.* Good-looking Dunham Baseboard, along the wall Fin-Vector Radiation, and fast-heating Convectors have both new and improved features that can save you time and trouble now, and insure customer satisfaction years from now.

So why bother to shop around getting one type of radiation here . . . another type there? Why not put all responsibility for heating performance squarely up to one manufacturer. Let Dunham do it . . . and you'll have no regrets whether you specify, install or live with Dunham Radiation.

For complete information . . . about this complete line . . . just clip and mail the coupon.

DUNHAM HEATING EQUIPMENT

RADIATION • UNIT HEATERS • PUMPS • SPECIALTIES

QUALITY FIRST FOR FIFTY-ONE YEARS

C. A. DUNHAM COMPANY • CHICAGO • TORONTO • LONDON

C. A. DUNHAM COMPANY
Dept. HV-6, 400 W. Madison St.
Chicago 6, Illinois

Send literature on ☐ Baseboard ☐ Fin-Vector ☐ Convectors

Name_____

Firm_____

Address_____

City_____ Zone____ State_____

Replies to Previous Problem

The following letters were received regarding the problem discussed in the May issue. It concerns the proposed use of a shell and tube condenser cooled by city water in connection with a 30-ton evaporative condenser that is short 7 tons in capacity to handle the full load. It was proposed to place the shell and tube condenser between the evaporative condenser and the receiver.

I would not recommend putting the shell and tube condenser and the evaporative condenser in series. This would mean one of two results: Either you would subcool the liquid only or you would merely lower the condensing temperature. I believe the former would most likely result.

It would be much more satisfactory to place these in parallel and to select them for the proper condensing temperature. This would assure that you were getting the additional capacity required.

There are usually several slight modifications which can be made to some evaporative condensers in order to tide them over a peak period:

(1) The fan can be speeded up about 10 per cent to obtain approximately a 5 per cent increase in capacity.
(2) It might be possible to increase the spray water quantity in order to increase the spray water temperature.
(3) It is possible to add a wetting agent or a surface acting agent, as they are sometimes called, to obtain a slight increase in capacity.
(4) You might add city water to the spray water to reduce the spray water temperature.

Any or all of these might give enough additional capacity to tide them over the peak period. It would be necessary, however, to have a complete picture of the installation, such as design conditions, city water temperature, and other data, to provide a complete answer.

C. L. Ringquist
Manager, Air Conditioning Sales Division
The Trane Company
La Crosse, Wis.

The problem for the May, 1954, issue is apparently somewhat similar to one recently undertaken by our office. In this case two rooms in a building were to be air conditioned, and the remaining spaces cooled by evaporative coolers. It was proposed that air washers be used for evaporative cooling and the water from the air washer sump be circulated through a tempering coil in the total air stream supplying the two air-conditioned rooms, as indicated in the attached schematic diagram. In this case computations indicated a decrease in refrigeration load of about 30 per cent under design outdoor conditions of 105 FDB and 72FWB.

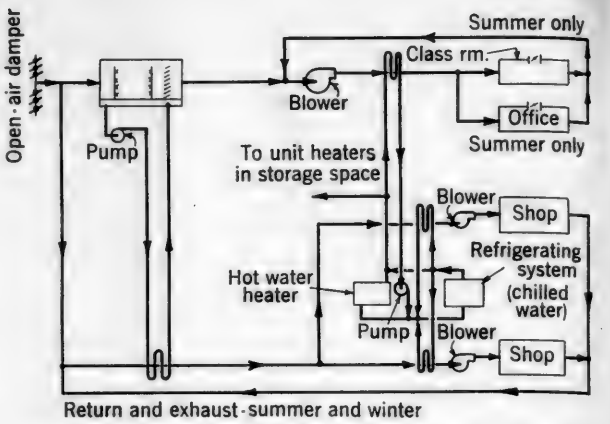


Fig. 3. Diagram of the installed air conditioning system.

It appears that this might be a practical answer to the problem under consideration. It is assumed that peak load occurs during conditions of high dry bulb temperature with corresponding relatively low wet bulb temperature. The evaporative condenser is primarily a device functioning on latent heat absorption, so the net result of recirculating water from the evaporative condenser sump may be to evaporate somewhat more water, requiring a slightly increased makeup.

The water supply, at or near the outside air wet bulb temperature, could be used in a shell and tube condenser in the refrigerant cycle, as suggested in the problem. Alternately, it could be used for tempering outside plus recirculated air stream, depending on the results of an economic study of the particular conditions surrounding this application.

The possible savings in city water usage may be considerable, and the savings in control equipment in using a system, such as that suggested, on a continuous rather than intermittent basis may be of interest. The suggested system may also be expected to decrease the normal compressor work, instead of only the peak load, and could result in a worthwhile continuous operating saving.

Thomas H. Seitz
Senior Mechanical Engineer
Sverdrup & Parcel, Inc.
San Francisco, Calif.

Cleveland Auditorium to be Air Conditioned

The installation of three large centrifugal refrigerating machines to handle the Cleveland Public Auditorium's complete air conditioning program was announced by Carrier Corporation. As the installation for the new system was announced, Cleveland's Convention and Trade Show Bureau was already laying plans to try to bring the next presidential conventions to this city.

Similar to the large cooling units installed by Carrier in Chicago for the last national political conventions, the Cleveland system will have one additional refrigerating machine and 25 per cent more capacity.

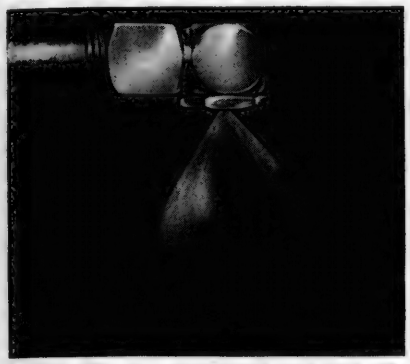
The system is designed to handle all cooling and dehumidifying requirements with the main auditorium packed to its 10,000 seat capacity, and with the 300-seat Music Hall also filled to capacity.

In the Cleveland Auditorium, two of the centrifugal units will handle the main hall and the third machine will serve the Little Theatre. Installation has started and it is expected to be completed soon.

NOZZLES ARE THE HEART OF COOLING EFFICIENCY

In early designs of large atmospheric cooling towers the water distributing system usually consisted of water box, flumes and distributing troughs. It was natural that engineers would look for a more efficient way to break up the water so that a greater area would be exposed to the cooling action of the air.

The first nozzles used for this purpose were crude, but a big step forward. After many refinements the Rotojet nozzle emerged as best suited for this work. It provided a hollow cone spray with remarkable fluid break-up.



For long life, low maintenance and high efficiency, cooling tower nozzles should be clog-proof and provide uniform spray patterns.

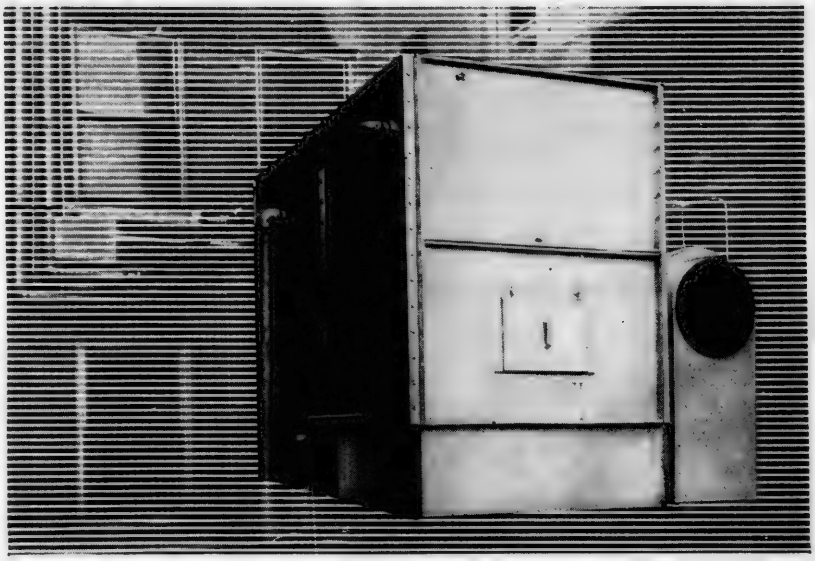
The Rotojets have no moving parts. They operate on the whirl chamber principle and are completely clog-proof under normal working conditions.

Engineers like the Rotojet for cooling tower installations because it is a precision-made nozzle. It is made in a wide range of sizes, permitting them to control the volume of water handled by a tower at a specified water pressure. This is important in the calculation of water to air ratios... the very heart of all cooling operations.

The whirl chamber principle of Rotojet nozzles gives maximum fluid break-up without the use of moving parts. This type of nozzle is clog-proof.

Full information on Rotojet nozzles and their many applications may be obtained by writing direct to the manufacturer, the Binks Manufacturing Company, 3120-38 Carroll Ave., Chicago 12, Ill. Adv.

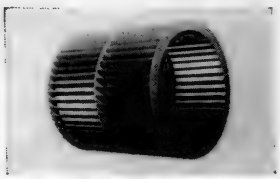
Binks series 3-B cooling towers



So-o Quiet...

Hotel guests sleep undisturbed

Guest rooms are only a few feet from the Binks cooling tower installed in the light court of the Malburne Hotel, Durham, N. C. But no one has complained or lost a wink of sleep. Binks cooling towers of the Series 3-B type are exceptionally quiet and are ideal for use where any noise at all would be objectionable.



Here's one reason why these towers are so quiet

Binks squirrel-cage blowers provide ample air movement while running at quiet speeds...far slower than the noisy propeller fans used in conventional towers.

You pay no more for this *extra quiet operation* and you get all these additional advantages:

- Controlled air movement through the tower makes Binks Series 3-B units independent of natural breezes.
- Air current moves in opposite direction to downward water flow. This accelerates the cooling action.
- Only dry air passes through the air propulsion assembly. Corrosion and maintenance are thus reduced.
- Non-clogging ROTOJET nozzles produce fine fluid break-up for maximum cooling.

A COMPLETE LINE OF NATURAL DRAFT AND MECHANICAL DRAFT COOLING TOWERS AND INDUSTRIAL SPRAY NOZZLES

REPRESENTATIVES IN ALL PRINCIPAL CITIES • SEE YOUR CLASSIFIED DIRECTORY

SEND TODAY for these bulletins:

No. 47-A—Type 2-B (3 to 30 tons)
No. 47-B—Type 3-B (1 to 108 tons)
No. 47-D—Type B-23-B (2 to 3 tons)

Binks
EVERYTHING FOR WATER COOLING

MAIL COUPON TODAY

Binks Manufacturing Company
3120-38 Carroll Ave., Chicago 12, Ill.

Gentlemen: Please rush FREE Cooling Tower Bulletins as checked:

☐ Bulletin 47-A ☐ Bulletin 47-B ☐ Bulletin 47-D

Name_____

Company_____

Address_____

City_____ Zone____ State_____

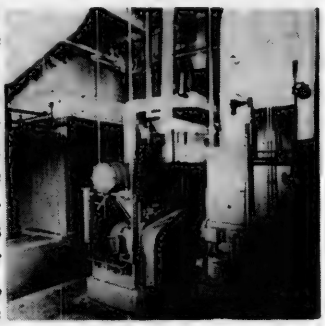
PRODUCT APPLICATIONS

New, Unusual, or Ingenious Uses of Equipment and Materials

Conducted by WM. B. FOXHALL, Associate Editor

9-Grain Air Produced in Volume

PROBLEM: To prevent moisture from damaging hygroscopic penicillin, American Cyanamid's Lederle Laboratories needed dehumidification equipment capable of delivering air at 9 grains of moisture per pound. The problem was to remove 30 gallons of water an hour from an air flow of 3,500 cfm delivered to the plant.



SOLUTION: Equipment using a lithium chloride base solution was installed to do the job. The system includes two Kathabar humidity control units, product of Surface Combustion Corp. Outside air enters these units at 95F and 122 grains per pound. There it is cooled, washed, dried by the lithium chloride base solution, mixed with recirculated air, and delivered after additional cooling and drying to the distribution system at 48F and 9 grains per pound.

RESULTS: Engineering calculations showed that the chemical dehumidifying system operating in this range would be less expensive than a refrigeration unit designed to do the same drying job. Conditions in the process area are maintained at 16 grains per pound against a heavy moisture load from the process.

Radiant Cooling Relieves Conditioning Load

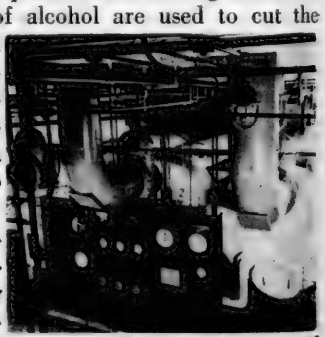
PROBLEM: In a large scale project of comfort conditioning and acoustic control of a major portion of the 16-story Port of New York Authority Building in New York City, relief was required for the load imposed on a conventional air conditioning system by excessive sun loads on the south and east sides of the structure. The structure was built originally as an industrial building with pillars supporting each floor, in contrast to the skeleton steel construction of modern skyscrapers. Large window areas on all sides of the structure were installed for light and ventilation. When the Port Authority adapted part of the building as an office structure, it was found that the windows facing the South and East allowed intense rays of the sun to pour in during sunny days. When it was decided to air condition and sound condition the building, engineers calculated that these windows would throw an exceedingly heavy burden on the air conditioning system and that an excessive number of air changes per hour would be required to keep occupants reasonably cool.

SOLUTION: At present, 8,290 sq ft of radiant cooling ceilings, product of the Burgess-Manning Company, are being installed on the 10th and 11th floors. Eventually, a total of 26,500 sq ft will be installed on the various floors that will be remodeled during the next few years. The radiant cooling ceiling is being installed in strips between 14 and 20 ft wide along the southern and eastern sides of the building. The radiant ceiling consists of a standard suspension system to which is attached a grid of galvanized piping which is used as a base for an upper acoustic-thermal insulation blanket and a lower surface to which metal pans are clipped to act as the room surface of the ceiling. Water which has been used in the conventional air conditioning system is recirculated through the radiant ceiling at 60F with a 5-degree rise. Controls of the two systems are arranged so that water temperature in the ceiling grid is above the room dew point which is approximately 55F.

RESULTS: Total heat load on the building air conditioning will eventually be 19,800,000 Btu per hr, of which radiant cooling will carry 450,000 Btu. Engineers calculate that the Burgess-Manning ceiling perimeter will relieve the air conditioning units by at least 17 Btu per sq ft and may handle as much as 21 Btu per sq ft. During hot weather overall room temperatures will be kept at 78F with a relative humidity of 45% when outside temperatures are at 95F.

Solvent Recovery Saves Alcohol

PROBLEM: At a Cincinnati plant manufacturing laminated plastics, large amounts of alcohol are used to cut the resin used on paper and other materials prior to impregnation and forming. Formerly, this solvent was vented through exhaust stacks and lost to the atmosphere.



SOLUTION: A solvent recovery system was designed and installed by Barnebey - Cheney Company of Columbus. The system consists of an activated carbon bed through which 12,250 cfm of exhaust air are forced after passing through a scrubber to remove resin. The carbon absorbs and holds the alcohol which is reclaimed during the re-activation process.

RESULTS: Over 2,000 gallons of denatured alcohol are recovered daily. The installation is said to have paid for itself in one year.

"How modern coal equipment saves us $9,000 a year and solves our smoke problem!"

Says Albert E. Unruh,
Chief Engineer
University of Detroit
Detroit, Michigan

This is a smokestack. This beautiful War Memorial Tower actually conceals the smokestack for the U. of Detroit's steam plant. Though it's in the very center of the campus, there's never any smoke problem, thanks to a modern coal-fired power plant.

"Again and again over the last decade, coal burned with modern equipment has proved itself the most flexible, economical fuel for heating our school buildings. We made our first investment in modern coal equipment shortly after the last war. By 'restokering' two existing boilers, we saved $9,000 the first year—actually $2,500 more than we estimated. At the same time, we solved a disturbing smoke and flyash problem and provided enough steam capacity to heat additional new buildings.

"We're completely sold on coal. And when our building expansion program required us to further increase steam production, we again chose a modern coal-fired boiler. Coal has proved its ability to handle increased loads and save us dollars year after year. And modern equipment eliminates smoke nuisance."

Additional case histories, showing how other types of plants have saved money by burning coal with modern equipment, are available upon request.

If you operate a steam plant, you can't afford to ignore these facts!

BITUMINOUS COAL in most places is today's lowest-cost fuel, and coal reserves in America are adequate for *hundreds of years to come.*

COAL production in the U.S.A. is highly mechanized and by far the most efficient in the world.

COAL prices will therefore remain the most stable of all fuels.

COAL is the safest fuel to store and use.

COAL is the fuel that industry counts on more and more—for with modern combustion and handling equipment, the inherent advantages of well-prepared coal net even bigger savings.

If you want to cut steam costs, it will pay you to investigate the advantages of modern coal equipment. For example, you may be able to save as much as 20% on fuel alone by replacing outdated equipment with modern stokers and boilers. Or, a small investment in modern controls and other up-to-date, fuel-conserving devices may boost efficiency of your present operation.

You can save on labor, too, by installing modern handling equipment. Modern coal-feeding and ash-removal systems can eliminate practically all hand labor.

Call in a consulting engineer. He can give advice on what equipment best fills your specific needs. And his recommendations may save you dollars year after year.

BITUMINOUS COAL INSTITUTE
A Department of National Coal Association
Southern Building, Washington 5, D. C.

FOR HIGH EFFICIENCY ... FOR LOW COST

YOU CAN COUNT ON COAL!

Controlling Dust in Publishing Plants

PROBLEM: Some of the operation in publishing plants include cutting, trimming, sanding, brushing and other handling and manufacturing operations in which paper dust becomes a problem. Much of this dust is very fine and travels considerable distances in the air before settling. This makes its effect felt virtually all over a plant.

SOLUTION: A common method for abating the dusty conditions involves the use of local exhaust ventilation. Hoods are placed over dust producing machinery with ducts leading from them to a collecting unit. One large book manufacturing company using this method is able to control dust from two bookbinding lines in its plant by means of only one dust control system.

Each line has three stations which produce dust. The first station has a moving saw blade which does the heavy trimming on pages. The second station has a sanding belt which takes the rough spots off the edges of the pages. The third station has a rotary brush to remove fine, clinging dust. A centrifugal collector alleviated the problem but was found to allow too much of the finer sized dust to escape. A cloth tube type collector was put into service. The cloth is in the form of cotton sateen tubes which are 5 inches in diameter and 70 inches long. Cotton cloth was specified as the filtering medium by engineers of American Wheelabrator & Equipment Corp. of Mishawaka, Indiana, who designed the collector. Dust trapped in the tubes is periodically shaken down into the collectors hopper from which it is removed for disposal.

RESULTS: About twice as much dust is trapped in the present system as was formerly collected. Air exhausted from the collector is so clean that the company is recirculating it back into the plant. Ventilation of all six stations of the two binding lines requires 1,080 cfm of air.

Chinchilla Industry Converts to Cooling

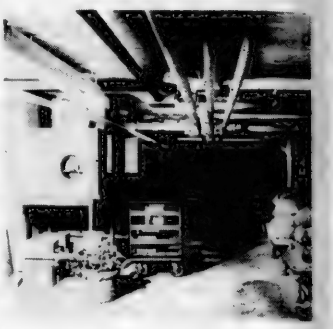
PROBLEM: A current drive sponsored by the National Chinchilla Breeders of America, Salt Lake City, to place pelts on the national fur market within the coming year resulted in delivery of thousands of dollars worth of furs into the Salt Lake City office. Furs had to be treated at extremely low temperatures to prevent germination of moth larvae, and subsequently had to be stored in cool spaces held at 55 to 65 percent R.H.

SOLUTION: A dual-section cooler using a Brunner refrigeration compressor unit and a Drayer-Hanson spasaver coil was erected by the Moore Butcher Supply Company. A small freezing section maintains a constant zero to 5F temperature where furs are held for about two days. The larger cooler is maintained at a temperature of 40F with relative humidity at 55 to 65 percent.

RESULTS: Tests have proved that moth eggs stored at the temperature of the freezing unit will die in about two days. The holding of pelts at the temperature of the storage unit assures high quality condition over considerable periods of time. Another use of refrigeration in the chinchilla industry is a one hour deep freeze immediately after killing. This freezing process insures a cleaner, more even removal of the pelt.

Dry Air Saves Dry Foods

PROBLEM: The Indiana State Sanatorium near the town of Rockville had the usual walk-in boxes and refrigerators for meats, dairy products, and vegetables. A large dry storage room in the basement was used for keeping such products as cereals, breakfast foods, and canned goods. A combination of heat and dampness in the summer proved injurious to these foods which tended to mold or spoil.



SOLUTION: To solve the problem, Hayes Brothers, Inc., of Indianapolis, installed an air cooling unit connected to a 10 horsepower refrigerating machine. The unit has fans which circulate cool dry air to all parts of the storage and hold it at a temperature not exceeding 60F. Units are manufactured by Frick Company which also supplied five low pressure units for other food preservation facilities of the hospital.

RESULTS: Humidity control provided by air conditioning was successful in preserving dry foods in an underground area subject to dampness.

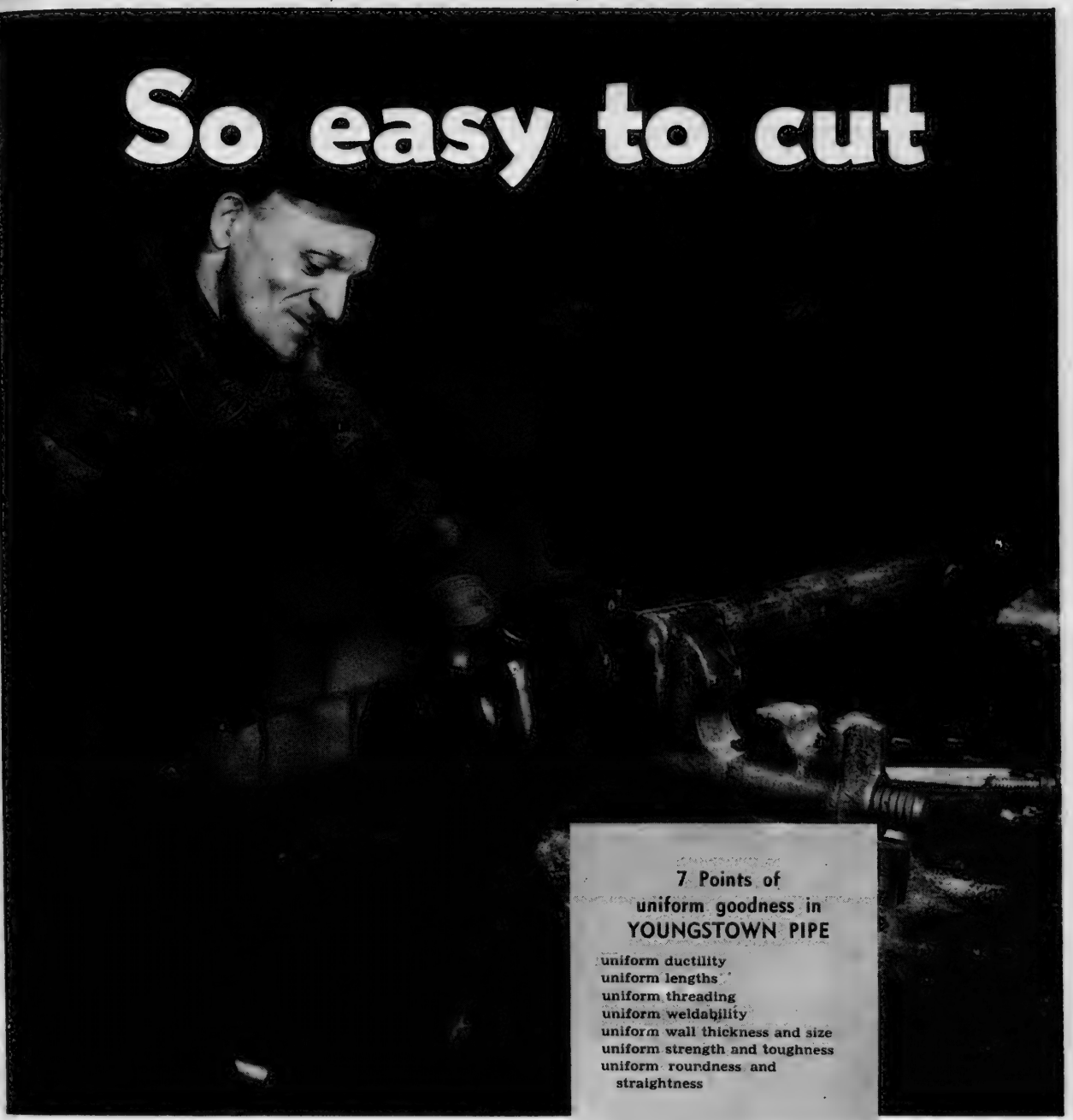
Switch to Aluminum Saved $50,000

PROBLEM: Estimates preliminary to retubing of Esso Standard Oil Company's seven redesigned wax sweater units at its refinery in Batan Rouge, La., showed that aluminum tube and fittings would be more economical than other materials. Esso's engineers had considered aluminum before but had dropped the idea because techniques for producing suitable aluminum fittings and welding the thin-walled tube to fittings had not been developed.

SOLUTION: Engineering divisions of Tube Turns and Alcoa collaborated in putting into service a new aluminum brazing technique. It consists of joining the flared ends of the tubing to the fittings by brazing with a double-tipped oxy-hydrogen torch. In order to accommodate the brazing technique, Tube Turns provided long radius 180 degree returns and 90 degree elbows with small tangents on each end. An aluminum alloy, Alclad 3S, many times more corrosion resistant than the commonly specified types, was selected. This tubing has an internal cladding of resistant alloy which protects the tubing and fitting from corrosion by its own electrolytic action with the rest of the material.

RESULTS: The new material saved Esso an estimated $50,000 in material costs.

So easy to cut



7 Points of uniform goodness in YOUNGSTOWN PIPE

- uniform ductility
- uniform lengths
- uniform threading
- uniform weldability
- uniform wall thickness and size
- uniform strength and toughness
- uniform roundness and straightness

● Youngstown pipe is plenty tough—but it's not tough to cut. A few turns of the cutter and the job is done—fast, clean, perfect! You save installation time when you work with Youngstown pipe.

Youngstown

QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices: Youngstown, Ohio - Export Office: 500 Fifth Avenue, New York 36, N. Y.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - BAR SHAPES - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - RAILROAD TRACK SPIKES

Modern design for busy buildings

Utica Mutual Insurance Company, New Hartford, New York. Heating Contractor: A. J. Eckert Co., Albany, New York.

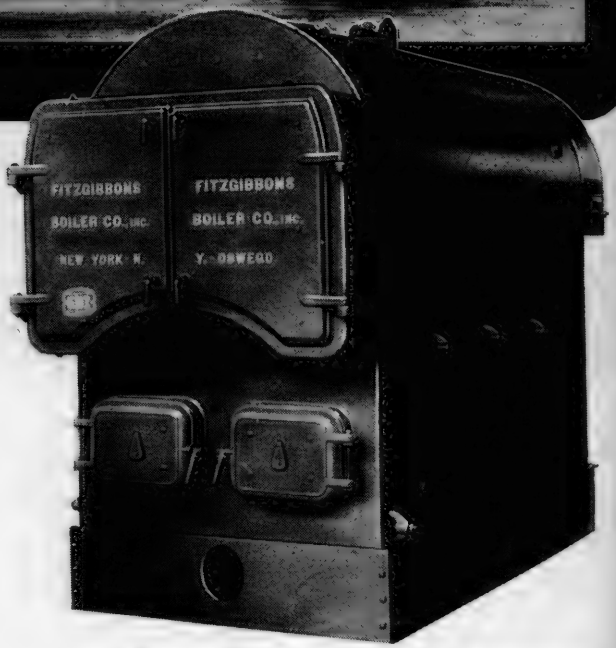
Marathon County Court House, Wausau, Wisconsin. Heating Contractor: R. Wenzel Co., Appleton, Wisconsin.

Edgewood School, Highland Park, Ill.
Heating Contractor: W. G. Godfrey, Chicago, Ill.

with modern heat by FITZGIBBONS

CHILDS & SMITH, ARCHITECTS AND ENGINEERS, CHICAGO, designed these three beautiful buildings. In specifying Fitzgibbons boilers for their buildings, they follow the modern trend among architects, engineers and the heating trade, which recognizes Fitzgibbons as "The Best in Steel Boiler Heat."

For complete information write to Fitzgibbons Boiler Company, Inc., 101 Park Avenue, New York 17, N. Y. Ask for Catalog HV-6.



The Fitzgibbons "D" Type Steel Boiler, for heating any type of large building, using oil, gas or coal.

SINCE 1886 MOST ECONOMICAL IN FUEL 1886 THE FITZGIBBONS BOILER

The Fitzgibbons Boiler®

SBI

PRODUCT INFORMATION SERVICE

Use the postage-free postcard below for further information on:

· News of Equipment and Materials

or a copy of the following

· New Catalogs

Enter the item Numbers in which you are interested and print clearly your name and address with title.

NEW CATALOGS

ALUMINUM DUCT DESIGN—A booklet entitled The Design of Aluminum Duct Systems, to give engineers and contractors practical and authorizative data on friction losses in air conditioning duct systems, is announced by Kaiser Aluminum & Chemical Sales, Inc., Oakland, Calif. The 32-page technical booklet was prepared by F. W. Hutchinson, of University of California and a consultant for Kaiser Aluminum. The publication is based on research done by Prof. Hutchinson and reports experimental tests which demonstrated the great smoothness of aluminum and low friction losses. Features of the design aid include: Two friction loss charts, graphical solutions for determining friction losses through fittings, charts for calculating required air volumes and rates of heat loss for ducts, worked out examples, and step-by-step design procedures and recommendations for sizing round or rectangular ducts for heating, ventilating, or air conditioning systems. .....Item 101

HANDBOOK ON INDUSTRIAL DRAFT CONTROL—A Handbook of Draft Control for Industrial Installations issued by Walker Mfg. & Sales Corp., St. Joseph, Mo. gives comprehensive coverage of draft controls for industrial applications in 16 pages. Featured is the company's BB (Ball Bearing) draft regulator, available in sizes ranging from 16- to 48-inch. .....Item 102

LINE OF TUBING — A new eight-page booklet, Wallingford Quality Tubing and Pipe, is announced by Wallingford Steel Co., Wallingford, Conn. The booklet describes ornamental, mechanical, pressure, sanitary, aircraft and shaped tubing, available from ¼- to 3-inch OD with minimum wall of .007 inch to maximum wall of .148 inch in stainless, carbon and alloy. Each type of tubing, with applications, is explained in detail in the booklet. ...Item 103

VERMICULITE IN MODERN INDUSTRY—A 15-page booklet entitled Versatile Vermiculite in Modern Industry is issued by Vermiculite Institute, Chicago, Ill. It contains information of four sizes of vermiculite and lists a number of current uses in each catagory. The examples were selected to suggest further possibilities to the building, manufacturing and industrial fields. Numerous sketches and photographs are included. .....Item 104

HEAT CONTROL SYSTEM—A four-page color brochure describing recent developments and refinements in the company's B-60 heat control system has been prepared by General Controls Co., Glendale, Calif. It illustrates the latest in snap-action and mercury switch thermostats, in gas control valves, and in pilot generators. New features of the basic B-60 gas control valve include smaller size with increased gas capacity; a main line filter screen; separate terminals for wiring of thermostat, limit control and pilot generator; increased relay power for positive pilot valve operation; and a simplified design requiring only four screws and one gasket. .....Item 105

SUBMERSIBLE PUMPS—A 4-page bulletin giving complete working details of its submersible pumps for domestic and industrial water well service is issued by Sumo Pumps, Inc., Stamford, Conn. In addition to giving a description of the pumps and how they operate, the bulletin shows a full color descriptive cutaway of a typical pump as well as a comprehensive installation diagram. Also included are selection tables for standard 4 and 6 inch pumps. .....Item 106

EXPLOSION PROOF MOTOR—A brochure describing the new Type EX explosion-proof motor and Type ED dust-tight motor is offered by The Lima Electric Motor Co., Lima, Ohio. The Type EX is designed for use in hazardous locations where gasoline, petroleum, naphtha, alcohols, acetone, lacquer solvent vapors and natural gas are present. The Type EX is a totally enclosed, fan-cooled, explosion-proof, UL Approved motor for Class I Group D Service. .....Item 107

LIQUID LEVEL CONTROLS AND VALVES—Catalog SC-5 has been published by McDonnell & Miller, Inc., Chicago, Ill. It is a revised edition of a catalog which has proved of considerable interest to engineers, designers and equipment manufacturers as well as heating contractors. In addition to the company's standard products, this catalog covers many of the special adaptations and components that have been developed over the years. Altogether it exhibits one of the most complete selections of float operated valves and switches ever offered. More like a handbook than the usual sales catalog, this new publication contains fairly complete engineering information, including capacity curves and roughing-in dimensions. .....Item 108

CONDITION OF THE ANTHRACITE INDUSTRY—The Manual of Statistical Information about the Pennsylvania anthracite industry published by Anthracite Institute, Wilkes-Barre, Pa., contains 31 tables and charts relating to production by various methods, such as stripping, underground, and culm bank; import and export of anthracite; freight rates to representative cities; degree day demand for heat in selected cities; and other subjects involving anthracite. .....Item 109

ELECTRIC INDUSTRIAL HEATERS — A 23-page booklet, B-6161, on electric heating units is available from the Westinghouse Electric Corp., Pittsburgh, Pa. Prepared in a convenient four- by nine-inch size, the new booklet presents complete data on heaters, thermostats and snap switches for the users of industrial electrical units. First sections of the handbook cover strip heaters, forced convention air heaters, room and oven heaters. The complete line of Corox heaters follows including immersion, bolt, finned and special shaped units. Cartridge heaters, glue and melting pots are included also. Latter sections of the booklet are devoted to the selection of the correct heater for a specific application. .....Item 110

Postage Will be paid by Addressee

No Postage Stamp Necessary If Mailed in the U. S.

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 53, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

HEATING AND VENTILATING

148 LAFAYETTE STREET

NEW YORK 13, N. Y.

READERS' SERVICE DEPT.

YEAR-ROUND COMMERCIAL CONDITIONER—A four-page, two-color bulletin C-4.23 describing the Spotaire year-round air-conditioning system for homes, motels and apartments is available from Drayer-Hanson, Inc., Los Angeles, Calif. This system utilizes individually-controlled room blower units with cooling-heating unit located remotely. Hot or cold water is piped through finned coils in the blower units, where a large, slow-speed fan conditions the area to the desired temperature. ----------Item 111

SMALL BOILERS—A four-page, two-color bulletin, AD-134, introducing the new CB line of small boilers is issued by Cleaver-Brooks Co., Milwaukee, Wis. This bulletin completely describes these new CB boilers, which are available in 15 to 40 hp (15 to 150 lb. steam, 30 lb. hot water) for heating and processing. Included are drawings and specifications on the new 15, 20, 30 and 40 models.---Item 112

BACKWARD-BLADE CENTRIFUGAL FANS—Bulletin No. BB-192 of General Blower Co., Morton Grove, Ill., contains 32 pages of information about the company's heavy duty industrial air moving equipment. Design and construction of the company's fans is detailed. Engineering aids in the selection of fans and their characteristics is presented, supplemented by charts and photographs. ------Item 113

PRESSURE LOSS CALCULATOR FOR STEAM VALVES—A new slide-chart calculator that quickly estimates pressure drop and indicates the proper size steam valve needed for any pressures up to 2500 psi is distributed by Golden-Anderson Valve Specialty Co., Pittsburgh, Pa. Printed on this calculator are full operating instructions and necessary technical data. ----------Item 114

ELECTRIC MOTORS—A condensed price list of its line of electric motors is issued by Howell Electric Motors Co., Howell, Mich. Squirrel cage, low starting current, fan cooled, non-ventilated, punch press, and elevator, are among the many types of motors listed. ----------Item 115

HOW TO SELECT A MOTORPUMP—A Booklet, dealing with the selection of the proper motorpump for any specific job, is published by Ingersoll-Rand Co., New York, N. Y. Actually this booklet is a slidefilm presentation in printed form. It gives a brief description of what a centrifugal pump is and how it works. Then it points out the various factors, such as the quantity, pressure, friction losses and head that must be considered in selecting a pump to meet a specific installation. Finally the booklet gives the material recommended for various pumping installation. ----------Item 116

HEAT TRANSFER EQUIPMENT—A new booklet on its heat exchanger division is issued by The Lummus Co., New York, N. Y. Rigid standards have been set up for heat transfer equipment, demanding uninterrupted service in operating economy. This booklet is intended to acquaint petroleum refining, power generation, and chemical processing industries with the work that has been done by the company in designing, engineering, and fabricating to meet these standards. The company manufactures condensers, heaters, evaporators, coolers, heat exchanges, generators, and steam jet refrigeration equipment. The booklet carries you through the operations required in the manufacture of this type of equipment, with complete illustrations and photographs. -------Item 117

RECOMMENDED SAFE WELDING PRACTICE—A 32-page booklet entitled Safety, offered by Air Reduction Sales Co., New York, N. Y., is specifically designed for welding and cutting operators handling oxy-acetylene and arc welding equipment. The booklet details safety cautions and rules for personal safety, the handling and maintenance of cylinders, torches, regulators and hoses. It discusses safe practices in setting up, adjusting, using and shutting down of the equipment. The story is presented in a clear, concise way with sketches illustrating safe practices as well as some of the mal-practices in the welding and cutting field. ----------Item 118

FLOAT AND THERMOSTATIC TRAPS—The 36-page catalog, of V. D. Anderson Co., Cleveland, Ohio, called Solving Steam Trap Problems is revised to include information on the company's new combination float and thermostatic traps said to vent air in one-eighth the time of standard inverted bucket traps. ----------Item 119

GENERAL SERVICE PUMP—A four-page illustrated bulletin, 1001 B, containing design features and specification data on its type GS general service pump is issued by De Laval Steam Turbine Co., Trenton, N. J. The pump is designed for easy maintenance and service. Bulletin illustrates the ease of maintenance and service features. ----------Item 120

REBUILDING STAMPING PRESSES—In response to growing interest in the opportunities for modernization of stamping presses through rebuilding, Verson Allsteel Press Co., Chicago, Ill., reissues its Bulletin No. R-19 entitled, New Life for Worn-Out or Damaged Presses. This 12-page bulletin outlines the company's rebuilding facilities and shows examples of typical rebuilding jobs. -------Item 121

INDUSTRIAL GAS-FIRED UNIT HEATERS—Bulletin No. 543-B, of Dravo Corp., Pittsburgh, Pa., illustrates a line of commercial and industrial, gas-fired, warm air unit heaters having output capacities of 88,000 to 160,000 Btu per hr. The four-page folder describes the two types; one for suspended mounting and one that can be built into duct type heating or air conditioning systems. Also included are tables listing heating and air delivery capacities, outlet temperatures, air pressure drops, weights and dimensions of the different units. ----------Item 122

DUAL RANGING SHUNTFLO METERS—An article entitled Dual Ranging Shuntflo Meters by Means of Squires Pressure Reducing Valves is reprinted by Builders-Providence, Inc., Providence, R. I. It is a progress report on a means for increasing the accuracy of steam flow metering where the flow rate varies and may be below 10 per cent of the maximum rate. The reprint describes the system used to obtain accuracies of 2% over a wide range. ----------Item 123

PACKAGED AUTOMATIC BOILER LINE—Eight-page Bulletin 1230 is published by Orr & Sembower, Inc., Reading, Pa., on the new Model 4 Powermaster packaged automatic boilers for firing light oil or gas. Details of design and construction and sample specifications are contained in the new bulletin. ----------Item 124

AIR CONDITIONING SUPPLIES — The 1954 Estimating Catalog of M. Blazer & Son, Passaic, N. J. covers fans, blowers, compressors, accessories, fittings, pumps, coil, condensers, valves, motors, V belt drive, grilles and registers, air conditioners, chillers, and other items in the heating, ventilating, refrigeration and air conditioning field. Introduced with this issue is the company's own line of cooling towers and evaporative condensers in sizes to 150 tons. ----------Item 125

ALL-STEEL, HIGH CAPACITY VALVES—A folder issued by Marine & Industrial Products Co., Philadelphia, Pa., describes and illustrates the company's Mipco valves, which are all-steel, of high capacity, and have no brass parts. The service range is said to be up to 2000 psig for air and gas, 1000 psig for steam. -------Item 126

INSTALLING OXYGEN PIPING IN HOSPITALS—A 12-page booklet How to Install Oxygen and Nitrous Oxide Piping Systems in Hospitals is issued by National Cylinder Gas Co., Chicago, Ill., for the guidance of piping contractors installing such systems. The booklet has two sections. One gives illustrated step-by-step instructions for making the silver brazed joints required for this type of piping system. The second section gives specifications for installing and testing lines according to NFPA standards. -----Item 127

COMMERCIAL AND INDUSTRIAL HEATING AND VENTILATING UNITS—Catalog No. 1620 on commercial and industrial heating and ventilating units is issued by Westinghouse Electric Corp., Boston, Mass. The 40-page catalog is divided into five separate data sections: descriptive, performance, layout, engineering, and service. Heating and ventilating units are covered with air volumes ranging from 1200 cfm to 23,000 cmf. A step by step procedure is given, which is of particular help in selecting a unit size. -------Item 128

PLEASE SEND US MORE INFORMATION

WRITE IN, below, the item numbers on which you wish further information —

Item No.	Item No.	Item No. .....
Item No.	Item No.	Item No. .....
Item No.	Item No.	Item No. .....

This service available only to U. S. and Canadian readers.

PLEASE PRINT June H-54

Name .....

Title .....

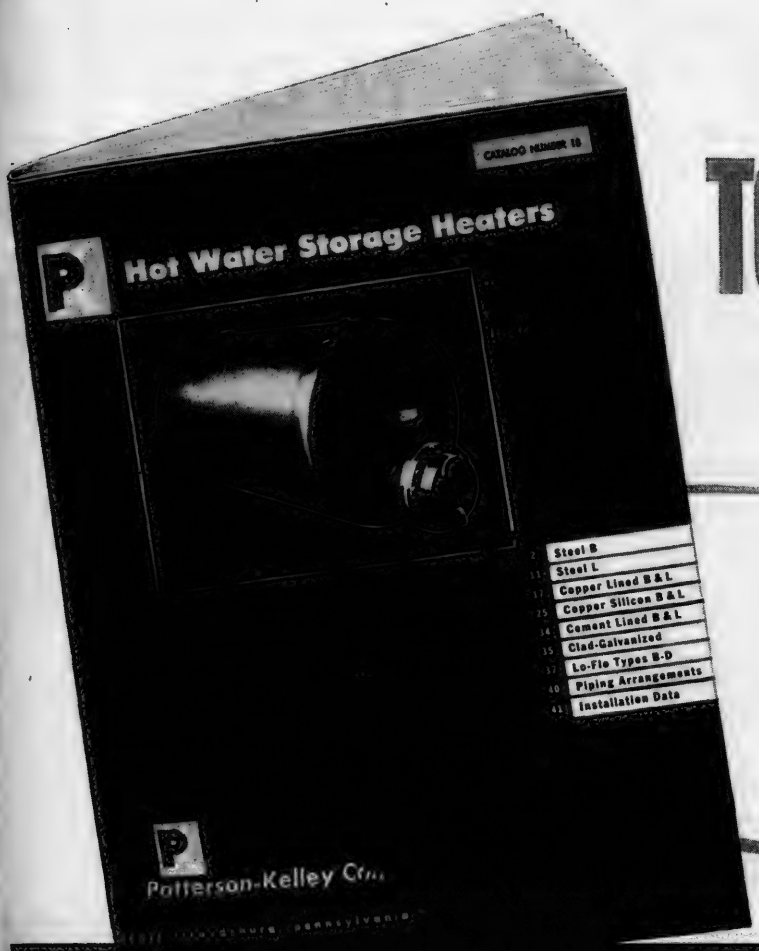
Firm .....

Nature of Firm's Business .....

Street .....

City ..... Zone .... State .....

This card is void after Sept. 1, 1954



TO HELP YOU SELECT and INSTALL

HOT WATER STORAGE HEATERS

All the facts you need to select and install hot water storage heaters . . . the most economical way to provide for peak hot water demands.

A new edition, expanded and revised to include the most up-to-date recommendations — one of the most complete reference catalogs of its kind. Covers all types, sizes and styles of hot water storage heaters . . . **p-k**, of course.

A basic reference work for architects, engineers and contractors selecting and installing hot water systems, and for users of hot water for process and service.

the ***Patterson-Kelley Co.,*** inc.

9. Burson Street, East Stroudsburg, Penn.

No Cost
No Obligation

Your copy is waiting for you. Either fill out the coupon or simply sign it and attach to your letterhead.

Please send me my copy of the *new* p-k hot water storage heater manual, Catalog 18. I understand that there is no cost or obligation.

NAME_____

TITLE_____

CO. NAME_____

ADDRESS_____

CITY_____ ZONE____ STATE____ 2536

101 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16 • and other principal cities

NEWS OF THE MONTH

RENTAL AIR-CONDITIONING

scores New York success. Plan permits older buildings to modernize without penalty of capital investment.

A modernizing scheme, introduced more than five years ago, has made it possible for older buildings in New York City to hold tenants who had contemplated moves into new air-conditioned structures. The plan was developed by Broadway Maintenance Corp. of Long Island City, N. Y., and is made feasible by the company's corps of electrical maintenance technicians and its fleet of 350 vehicles. Among other operations, Broadway maintains a 24-hour-per-day schedule to service the street lighting systems of New York and Pittsburgh.

• **PROPOSAL.**—There is a two-fold appeal for a customer to subscribe to the plan. First, he is offered outright ownership of the air-conditioning and/or heating system. Second, he is offered a rental contract whereby Broadway installs and maintains the system for a fixed charge over a 5-year period.

Since the customer always has the option of ownership or rental, there is added incentive to develop plans and specifications which assure maximum user-satisfaction at the lowest practical lifetime cost.

• **TAXES.**—Success of the rental plan during the past five years is partly due to customers' desire to avoid unnecessary capital expenditures. It is a widely held opinion that a minimum of $1.66 must be earned for every dollar spent in this manner. In a case where a $100,000 air conditioning system is under consideration, the business firm must earn at least $166,000 *after* taxes in order to cover the air conditioning investment. Contrasted to this, the same air conditioning system will be installed and maintained on the rental plan for $40,000 annual operating charge *before* taxes, over a five-year period. This means that a company can have an air conditioning installation without penalizing its future earnings.

The rental plan is flexible to fit the customer's needs. He can have maintenance service for five years or for a longer period of time as he chooses; the Broadway plan also permits him to take over complete ownership of the system should he desire to do so.

Rental rates being paid in older buildings are substantially lower than those in air-conditioned structures. The difference between these rental rates can pay the entire cost of new, leased air-conditioning installations and show the owner a substantial increase in his income over the cost of the rented equipment.

• **EXAMPLE.**—One industrial plant in the New York area found itself in a difficult situation recently. It was making products under government contract and was having 60% of the output rejected due to corrosion by sea coast air and dust. To get government approval on a capital expenditure would have taken months and financial losses would have been large during the delay. Broadway Maintenance installed a rental air conditioning system in record time. Plant rejects dropped to an insignificant level and costs are being paid as an operating expense.

At the end of five years, the Broadway rental plan permits the user to continue the yearly maintenance contract at a reduced rate or take title to the air-conditioning installation. In most cases, customers elect to continue the rental arrangement for an extended period.

INSULATION TESTS

surveyed at meeting of ASTM committeee on thermal insulating materials.

The effect of moisture and water vapor transmission of insulating materials received considerable attention at the meeting of Committee C-16 on Thermal Insulating Materials during ASTM Committee Week in Washington, D. C. The special research program at Pennsylvania State University has shown good progress, especially in the use of the probe method of measurement on dry materials. However, the proper technique for the measurement of wet materials by this method of requiring more study. A final draft of the proposed method for determining water vapor transmission of materials used in building construction was accepted for letter ballot of the committee.

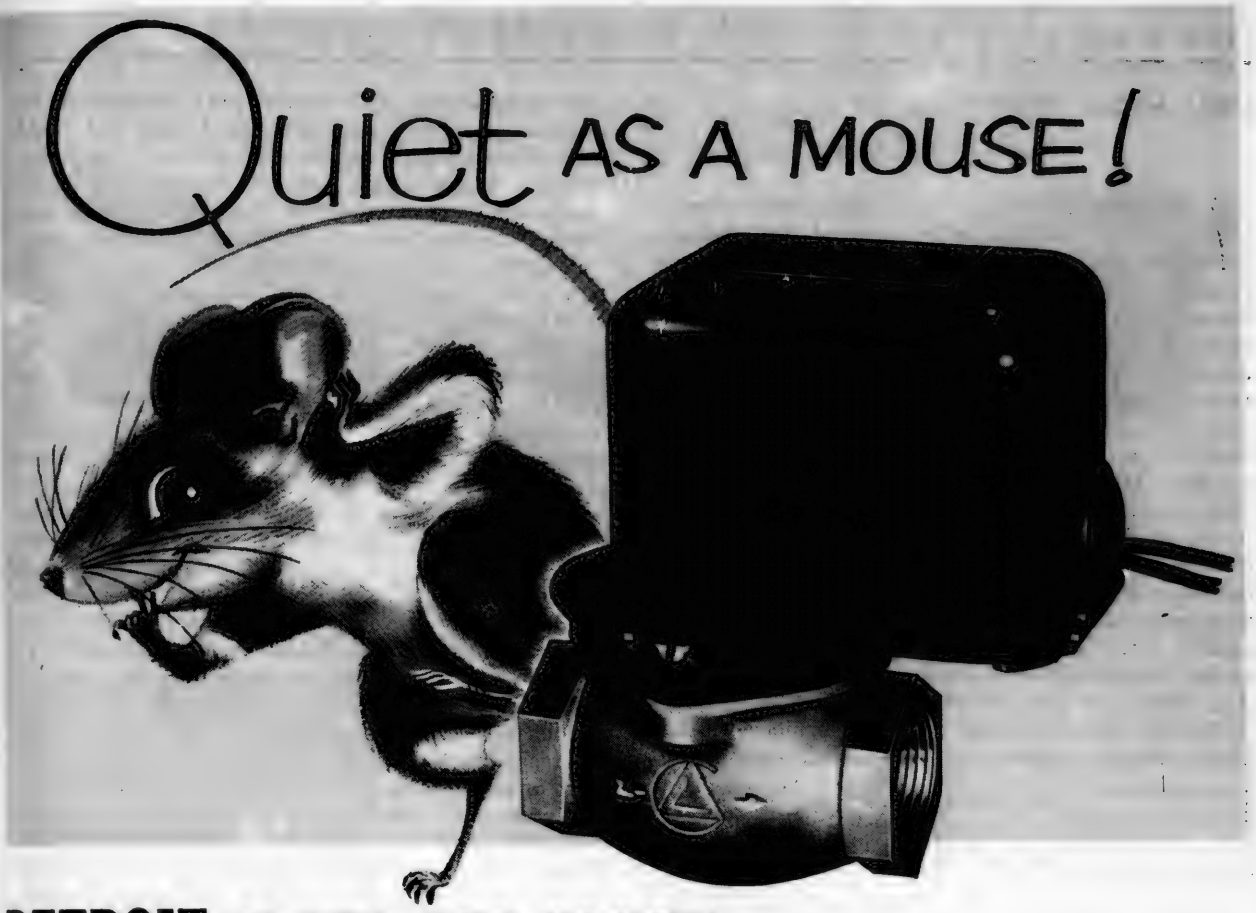
• **TEST METHOD.**— It was the decision of the committee to discontinue the existing Tentative Methods of Test for Water Vapor Permeability of Sheet Materials Used in Connection with Thermal Insulation (C 214 T), in view of the publication of the Tentative Methods of Test for Measuring Water Vapor Transmision of Materials in Sheet Form (E 96 T). The latter method has essentially the same coverage and therefore can be used for thermal insulating materials.

Certain tentatives and tentative revisions were recommended for adoption as standard, these including Method of Test for Compressive Strength of Preformed Block Type Thermal Insulation (C 165), Tentative Specification for Mineral Wool Blanket Insulation (Metal-Mesh Covered) (Industrial Type) (C 263 T), and Tentative Specification for Mineral Wool Blanket-Type Pipe Insulation (C 280 T).

• **SPECIFICATIONS.**—Proposed tentative specifications were accepted for letter ballot of the committee covering calcium silicate block, calcium silicate pipe covering, and cellular glass block. Proposed test methods approved for letter ballot included the determination of adhesion of dried thermal insulating cements, the comprehensive hardness of thermal insulating cements, specific heat, and linear shrinkage upon soaking.

The development of specifications covering additional thermal insulating materials was authorized to include

(*Continued on page* 140)



DETROIT V-579 "BI-FLEX"

The Quiet-Acting GAS VALVE—Performance Proven for Reliable Service on Thousands of Installations!

Check These Features

- Quiet operation—no click, no hum
- Rugged, compact—easy to service
- Inexpensive
- For all gases in all localities
- "Bi-flex" motor operated—low voltage
- Compensated for changes in ambient temperature
- Snap-acting opening and positive closing
- ½-inch to 1¼-inch sizes

Here is a gas valve which is actually quiet in operation! Its strong "Bi-flex" motor provides unfaltering opening and tight shut-off closing with absolutely no annoying, worrisome bangs, clicks or hums. Thousands of installations have proved its unsurpassed reliable, trouble-free performance. Simple in design, positive in operation, the V-579 operates independently of gas pressure and is available in sizes to fit any domestic heating system. Write today for Bulletin No. 229.

NO. 411—*the sensitive and accurate Timed Cycling Thermostat for all types of heating systems. Provides close control of room temperature. Attractively styled, easily installed and adjusted. Write for Bulletin No. 193 and Form No. 1545-A.*

DETROIT CONTROLS *Corporation*

5900 TRUMBULL • DETROIT 8, MICHIGAN

Division of American Radiator & Standard Sanitary Corporation

Representatives in Principal Cities • Canadian Representatives in Montreal, Toronto, Winnipeg—Railway and Engineering Specialties, Ltd.

AUTOMATIC CONTROLS for REFRIGERATION

AIR CONDITIONING • DOMESTIC HEATING • AVIATION • TRANSPORTATION • HOME APPLIANCES • INDUSTRIAL USES

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS • SUNBEAM AIR CONDITIONERS

INSULATION TESTS

(*Continued from page* 138)

cork pipe covering insulation and cellular glass thermal pipe insulation. An important test method. that of determining the density at which loose fill insulations should be applied, has shown good progress with data indicating reproducibility of results. A companion method for measuring the density using vibration was also reviewed. The adaptation of thermal conductivity measurements determined by the Standard Method C 177 to low temperatures was recommended, and the proper subcommittee will study this for possible revision of the method.

• **FIRE.**—The problem of developing a suitable small scale test for measuring flame spread or fire resistance is still receiving attention in at least three of the subcommittees dealing with specific types of thermal insulating materials. Current activity will now include the preparation of review of fire test data on thermal insulating materials where the tunnel test method as described in ASTM Tentative E 84 was used and the angle-iron frame procedure found in Federal Specifications SS-A-119a. The next meeting of the committee will be held in the fall at a place to be announced.

INDUSTRIAL HEALTH CONFERENCE

draws 2,000 to annual briefing on worker health problems. Technical papers and exhibits featured.

More than 2,000 specialists concerned with maintaining the health of industrial workers in healthful working environments converged on the Hotel Sherman in Chicago during the final week of April. Engineers, nurses, physicians, dentists, and government officials joined forces in an annual Industrial Health Conference featuring concurrent meetings of five professional associations. In addition to the technical sessions and committee meetings of the associations, were exhibits maintained by 87 suppliers of products and services used in the field.

The five organizations holding annual meetings were The Industrial Medical Association (39th), American Industrial Hygiene Association (15th), American Conference of Governmental Industrial Hygienists (16th), American Association of Industrial Nurses, Inc. (12th), and American Association of Industrial Dentists (11th). The governmental hygienists, including directors and associates of federal, state, and local health agencies, convened for meetings of standing committees on Saturday, April 24. Committees are assigned the duty of asembling data and checking current practices in various special areas of interest such as industrial ventilation, hygiene codes, standards, threshold limits, air pollution, and professional practices. Technical program of this group included a series of round table discussions on the separate problems of chemists, engineers, nurses, and physicians and papers covering the problems of state and local health agencies as well as on the techniques of maintaining the industrial environment at acceptable levels. A panel discussion on threshold limits was moderated by James H. Sterner, M.D., Eastman Kodak Company, and a joint session of ACGIH and AIHA offered four papers on various problems of industrial hygiene instrumentation. The joint session was under the co-chairmanship of presidents of the participating associations, Joseph Shilen, M.D., Pennsylvania Department of Health, president of ACGIH; and Henry F. Smyth, Jr., Ph.D., Mellon Institute, Pittsburgh, president of AIHA.

• **AIHA.**—Of primary interest to engineers in the heating and ventilating fields were technical sessions of the AIHA. In addition to problems in the control of toxic and irritant dusts and fumes in industrial atmospheres, there is increasing attention among engineers of this group to problems in industrial noise, radiation, excessive heat, and outdoor air pollution in general. Diversity of the spheres of influence of modern industrial hygienists was emphasized by the ability of this group to schedule concurrent sessions on various specialties. These sessions offered groups of technical papers on air pollution, chemical determinations, radiation, engineering, and toxicology.

Increasing attention of industrial hygiene engineers to problems in outdoor air pollution reflects the growing awareness among all persons charged with facing problems of atmospheric pollution of the fact that such contamination originates and may be best controlled within the plants which generate the contaminating substances. Breadth of the problem is illustrated by the range of titles of technical papers offered in an air pollution session arranged by George D. Clayton of the U. S. Public Health Service. Subjects included the effect of industrial gases on plants, air pollution in an area adjacent to a plant processing blast furnace slag, biological effects of exposure to smog, an atmospheric pollution study of a non-industrial area, and others. It was pointed out in some of these papers that control of outdoor air pollution may eventually be one of the prime concerns of heating and ventilating engineers charged with the design of the fuel and air handling systems of industrial buildings. Increasing pollution discernible in the atmospheres of non-industrial areas may lead to increasing stringency of laws affecting the permissible limits of plant effluents.

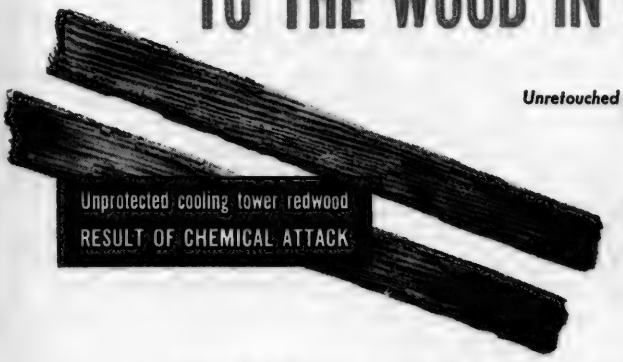
• **ENGINEERING.**—Sessions of the engineering division of AIHA were arranged by Kenneth W. Nelson, American Smelting & Refining Co. Papers included a discussion of fog type scrubbers by F. A. Thomas, Jr., C. R. Kernan, Jr., Lt. Ben F. Bryan, USAF, and Duncan G. Hudson. The paper was delivered by Mr. Thomas and concerned the ability of fog type scrubbers to perform efficiently under various conditions of both water pressure and contaminant.

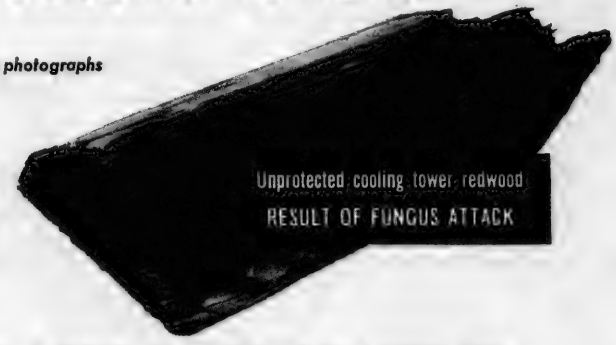
• **FILTERS.**—A paper on the field evaluation of wet fiber filters for treatment of air contaminants by M. W. First and R. P. Warren was delivered by Mr. First. Gas absorption equipment utilizing wetted fiber beds has been shown to have important advantages over conventional methods for the concentration and recovery of valuable gases, Mr. First said in introduction to a paper concerned with utilization of similar equipment

(*Continued on page* 142)

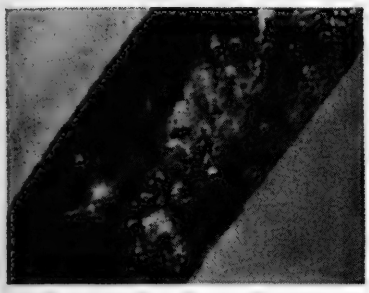
LOOK WHAT CAN HAPPEN TO THE WOOD IN COOLING TOWERS

Unretouched photographs





PRESSURE CREOSOTING ADDS YEARS OF LIFE TO HALSTEAD & MITCHELL COOLING TOWERS



FUNGUS ROTTED UNPROTECTED DECKING

Unretouched photographs

CLEAN PRESSURE-CREOSOTED DECKING

Examine these unretouched photographs carefully. Constantly wetted wood decking in a cooling tower is subject to immediate attack by fungus and marine parasites. It is also subject to chemical deterioration from acids in water. All wood used in Halstead & Mitchell Cooling Towers is protected against these twin enemies.

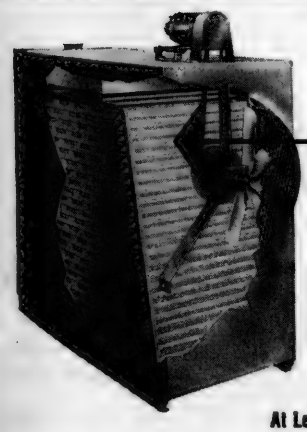
WHY PRESSURE CREOSOTING?

Creosote . . . *with 162 elements toxic to fungus growth and parasites* . . . also makes wood more resistant to chemical attack. Deep penetration of the wood by Koppers Pressure-Creosoting gives the longest possible wetted decking life. Therefore, all Halstead & Mitchell Cooling Tower decks are Pressure-Creosoted, and are guaranteed against rotting due to fungus growth . . . for 20 years!

ONLY HALSTEAD & MITCHELL OFFERS THE

20-Year Guarantee!

ON THE WETTED DECK SURFACE against rotting by fungus attack



2 thru 100 Tons

Sheet-Steel Cabinets, 5-times protected
Stainless Steel Fans and Shafts
Weather Shielding
Everdur Bolts for ease of disassembly at any time.

HM Halstead & Mitchell

At Leading Refrigeration & Heating Wholesalers Everywhere

OFFICES: Bessemer Bldg., Pittsburgh 22, Pa.

INDUSTRIAL HEALTH CONFERENCE

(*Continued from page* 140)

for the prevention of atmospheric pollution and neighborhood nuisances by the treatment of waste gases too lean for economical recovery. Very porous beds of small-diameter fibers, either glass or plastic, permit high gas rates without flooding or channeling and provide large wetted areas for rapid gas absorption. The use of neutralizing or reacting scrubbing solutions permits high absorption capacity without excessive cost for fresh solvent in the treatment of obnoxious trace gases. A single stage unit containing a three- to four-inch deep wet fiber bed was found to be capable of removing 70 to 80% of a contaminant, and three identical stages in series were capable of effecting a 99% improvement in the stack effluent. The final stage of each unit is a dry fibrous filter which acts as an efficient droplet eliminator.

• **HOODS.**—Laboratory fume hoods were evaluated in a paper by H. F. Schulte and others of the Industrial Hygiene Group at Los Alamos Scientific Laboratory. Hoods at the laboratory were tested by measuring face velocities and observing smoke patterns in the hood as affected by cross draft, thermal loadings, slot openings, entrance shapes and other factors. Recommendations as developed from the study were for an average face velocity of 100 fpm and a minimum velocity of 80 fpm for hoods handling moderately toxic substances. Hood entrances should be kept free of obstructions and irregularities such as corner posts, sinks and excessively depressed bases. A slight improvement in air pattern is obtained by the use of air foils. When doors are used on hoods, a mechanically operated bypass is desirable to keep face velocities below 100 fpm when the sash is closed to a 6-inch opening. Hood blowers should be located at the discharge end of the exhaust system to maintain a negative pressure in the conveying duct. A cross draft may tend to syphon contaminated air out of the hood and should be taken into account in setting the design face velocity.

• **DUST CONTROL.**—A rational approach to the theoretically required exhaust rates for dust control in bulk material handling systems was set forth in a paper by W. C. L. Hemeon, engineering director, The Industrial Hygiene Foundation, Mellon Institute, Pittsburgh. Developing the known relationships between the resisting force due to air drag on a particle and the particle velocity, a statement is derived in terms of the power represented by a falling particle. Mr. Hemeon then develops an expression for the total power in a falling stream of particles. Assuming that the power developed by such a stream is devoted to the acceleration of portions of the surrounding atmosphere, a basis is provided for describing the theoretical maximum rate of air motion. This is the theoretically maximum amount of air which will be induced into an enclosure receiving the column of falling materials. The exhaust rate from the enclosure in a dust control system can then safely be set at that amount, especially so in view of the conservative nature of the simplifying assumptions made in development of the equations.

Where the height of the falling column of material is so great that the velocities attained are in the range of turbulent motion over the greater portion of the column, the expression for total horsepower developed is

$$\text{Total horsepower} = \frac{0.29RS^2}{Zd_m}$$

where R is the rate of flow of solid material in pounds per second, S is the height of the falling column in feet, Z is the specific gravity of the material (water = 1), and d_m is the mean particle diameter in microns.

The quantity of air induced is shown by the expression

$$q^3 = (\text{horsepower})\,A^2 \times 10^{11}$$

where q is air flow in cfm and A is the cross section area of the falling column.

Mr. Hemeon showed the derivation of these two equations and described a similar relationship for shorter columns where the rate of air motion is in the intermediate zone of turbulence. He was able to show that the rates of air induction calculated by theory were in close agreement with rates found by Pring and associates in an experiment with falling water droplets. Mr. Hemeon mentioned that the material presented in his paper is a condensation from a chapter in his book which is to be published shortly by The Industrial Press.

• **URANIUM.**—A paper by H. I. Miller, Jr., Catalytic Construction Co., described problems in the ventilation and dust control system in a $2 million plant for refining uranium ores and concentrates. Although the requirements for dust control are more stringent than those ordinarily encountered, due to the radiation barriers and high efficienies required, the engineering approach was in accordance with usual industrial hygiene engineering principles and involved isolation of the process or the operator, application of local and general exhaust ventilation, filtration of dust from collected air and its return to process, provision of adequate make-up air, and the use of wet methods. The importance of integrated design was stressed, and examples of design problems included procedures leading to selection of Hershey reverse jet collecters for dry dust collection.

• **PROCESS.**—A program for the protection of the health of employees of a plant extracting benzene from petroleum refinery streams was described in a paper by F. S. Venable, Esso Standard Oil Company. Protective measures against acute and chronic poisoning include periodic air analyses, high vapor concentration alarm systems, periodic blood and urine sampling, and respiratory protection. Methods of reducing exposures during loading of tank cars were described.

A method for the control of chromic acid mist from electroplating operations by a new type of surface active agent of high stability and efficiency was described in a paper by George Hama, and W. G. Fredick, Detroit Department of Health, and Henry Brown, Udylite Corp. The active agent controls chromic acid mist within acceptable limits and also reduces the carry-out on parts by reducing the surface tension of the plating solution.

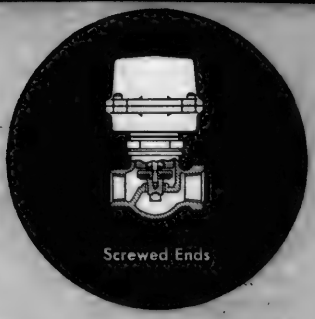
• **OFFICERS.**—At the annual banquet of the AIHA the Donald E. Cummings Memorial Lecture was delivered by Frank A. Patty, General Motors Corp., who described progress in industrial hygiene during the past fifteen years. Retiring president Henry F. Smyth, Jr., was succeeded in that office by Herbert T. Walworth, Lumber-

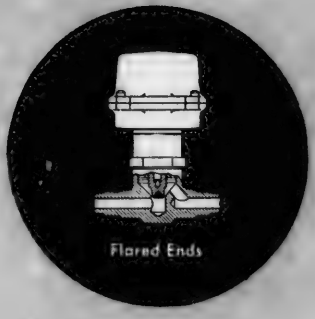
(*Concluded on page* 144)

POWERS

First with duo-seal

PACKLESS CONTROL VALVES



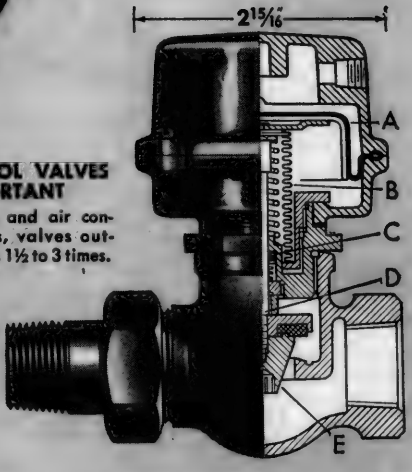


DURABLE AIRTIGHT CONSTRUCTION

GOOD CONTROL VALVES ARE IMPORTANT

On many heating and air conditioning systems, valves outnumber thermostats 1½ to 3 times.

Available in Various Types and Sizes

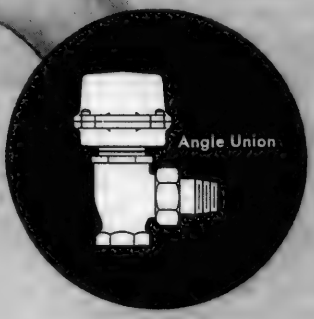


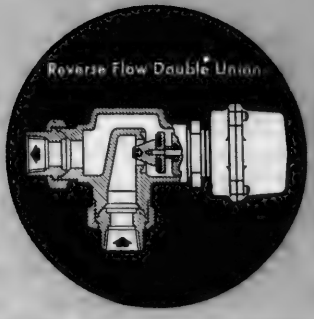
Rugged Cast Aluminum Top

A) Durable Molded Diaphragm
B) Bronze Bellows, Primary Seal
C) "O" Ring, Secondary Seal
D) Polished Stainless Steel Valve Stem
E) Characterized Throttling Nut

More ACCURATE Control with Powers PACKLESS Valves

Minimum valve stem friction. No packing nut or gland to be tightened, oiled or adjusted. No binding of valve stem as with conventional packing. Powers **duo-seal construction** assures better performance and—





No Packing Maintenance. No Leakage of Water or Steam. No Loss of Vacuum.

To insure getting a temperature control system with the best control valves made for convectors, unit air conditioners, unit ventilators, radiators, panel heating and cooling coils—specify or install POWERS pneumatic control.

Established in 1891 • **THE POWERS REGULATOR COMPANY** • SKOKIE, ILL. • Offices in Over 50 Cities

INDUSTRIAL HEALTH CONFERENCE

(*Concluded from page* 142)

men's Mutual Casualty Company. President-elect for the coming year is N. V. Hendricks and secretary is Norton Nelson, NYU College of Medicine. Lester V. Cralley, Aluminum Company of America, continues as treasurer and Mr. Smyth will continue as executive secretary until action can be taken on his request to be relieved of that post early this year. Newly elected directors of the association are V. J. Castrop, General Motors; W. T. McCormick, Inland Steel; and E. P. Wheeler, Monsanto Chemical Co.

NEW INSULATION

may reduce 4-inch refrigerator wall to 1/4 inch without increasing heat transfer, GE says.

How scientists of the General Electric Research Laboratory applied scientific principles to the development of an entirely new thermal insulation that is the most promising improvement in household refrigeration in years, was disclosed briefly at a Buffalo demonstration by Dr. C. Guy Suits, GE vice president and director of research.

Dr. Suits told a session of the Technical Societies Council of the discovery of a new insulation for refrigerators, capable of reducing the present four-inch thick walls to only about a fourth of an inch, without reducing insulation efficiency. The new development in thermal insulation promises to be an outstanding application of fundamental science to a longstanding human problem.

Up to now, with the exception of the thermos bottle and Dewar flask, the best thermal insulation found consisted of finely divided matter in either powder form or fibre form such as asbestos or glass wool.

"One of the important functions of such finely divided material in insulation", the director of GE research declared, "is to immobilize air. It is the circulation of air due to convection, which transfers most of the heat in insulation. Hence, if the air can be immobilized in the interstices of the insulation, the transfer of heat is retarded."

• **PRINCIPLE.**—The principle of the thermos bottle was obviously far superior to any other fundamental yet known, Dr. Suits asserted, explaining that it couldn't be applied to a household refrigerator earlier because refrigerators have flat panels rather than self-supporting walls. The problem was to support these flat panels, without conducting appreciable heat, against the crushing strength of atmospheric pressure (more than a ton for each square foot).

"How to accomplish this seemingly impossible requirement was discovered recently in our laboratory by Drs. F. P. Bundy and H. M. Strong," he said. "The result is going to have very important uses in industry and the home. This new flat panel vacuum insulation is the most perfect heat barrier ever devised. It is from ten to thirty times more effective that the best flat insulation in common use, and in its best form, is three times better than the Dewar flask or thermos bottle."

Shown to the audience was a photograph of a thin panel or this insulation only one quarter inch thick, which scientific tests showed to be conducting about the same amount of heat as four inches of conventional insulation.

ASHVE

plans technical papers and historical tours for semi-annual meeting in Massachusetts.

Research on future needs and trends in the field of human comfort will be the theme of discussion at The American Society of Heating and Ventilating Engineers Semi-Annual Meeting, June 28-30, at the New Ocean House, Swampscott, Mass., just a few minutes from Boston. R. T. Kern, Fitchburg, Mass., is chairman of the Committee on Arrangements.

Registration of members and guests starts Sunday, June 27, and Society President L. N. Hunter, Johnstown, Pa., will call the first of four technical sessions to order, Monday morning at 9:30.

• **PROGRAM**—The technical program for the meeting is as follows:

Monday, June 28, 9:30 a.m.

Physiological Responses to Sudden Changes in Atmospheric Environment: Studies of Normal Subjects, Obese, Hypothyroid and Hyperthyroid Patients, by Tohru Inouye, F. K. Hick, M.D., R. W. Keeton, M.D., and Lionel Bernstein, M.D., Chicago, Ill.

A Rapid Heat Meter Thermal Conductivity Apparatus, by J. D. Verschoor and Ada Wilber Manville, N. J.

Irradiation of Vertical and Horizontal Surfaces by Diffuse Solar Radiation from Cloudless Skies, by G. V. Parmelee, Cleveland, Ohio.

Tuesday, June 29, 9:30 a.m.

Characteristics of Downward Jets of Heated Air from a Vertical Discharge Unit Heater, by Linn Helander, S. M. Yen and L. B. Knee, Manhattan, Kansas.

Computing Temperatures and Velocities in Vertical Jets of Hot or Cold Air, by Alfred Koestel, Cleveland, Ohio.

Sound-Pressure Levels and Frequencies Produced by Flow of Water through Pipe and Fittings, by W. L. Rogers, Evanston, Ill.

*Computation Charts and Theory for Rectangular and Circular Jets, by H. G. Elrod, Jr., Cleveland, Ohio.

Wednesday, June 30, 9:30 a.m.

Filtration of Microorganisms from Air by Glass Fiber Media, by H. M. Decker, J. B. Harstad, F. J. Piper and M. E. Wilson, Frederick, Md.

Effects of Room Size and Non-Uniformity of Panel Temperature on Panel Performance, by L. F. Schutrum and J. D. Vouris, Cleveland, Ohio.

Performance Data on Ceiling Panel Heating and Cooling, by R. J. Mindak and I. B. Fieldhouse, Chicago, Ill.

Cooling Load from Sunlit Glass and Wall, by C. O. Mackey and N. R. Gay, Ithaca, N. Y.

2:30 p.m.

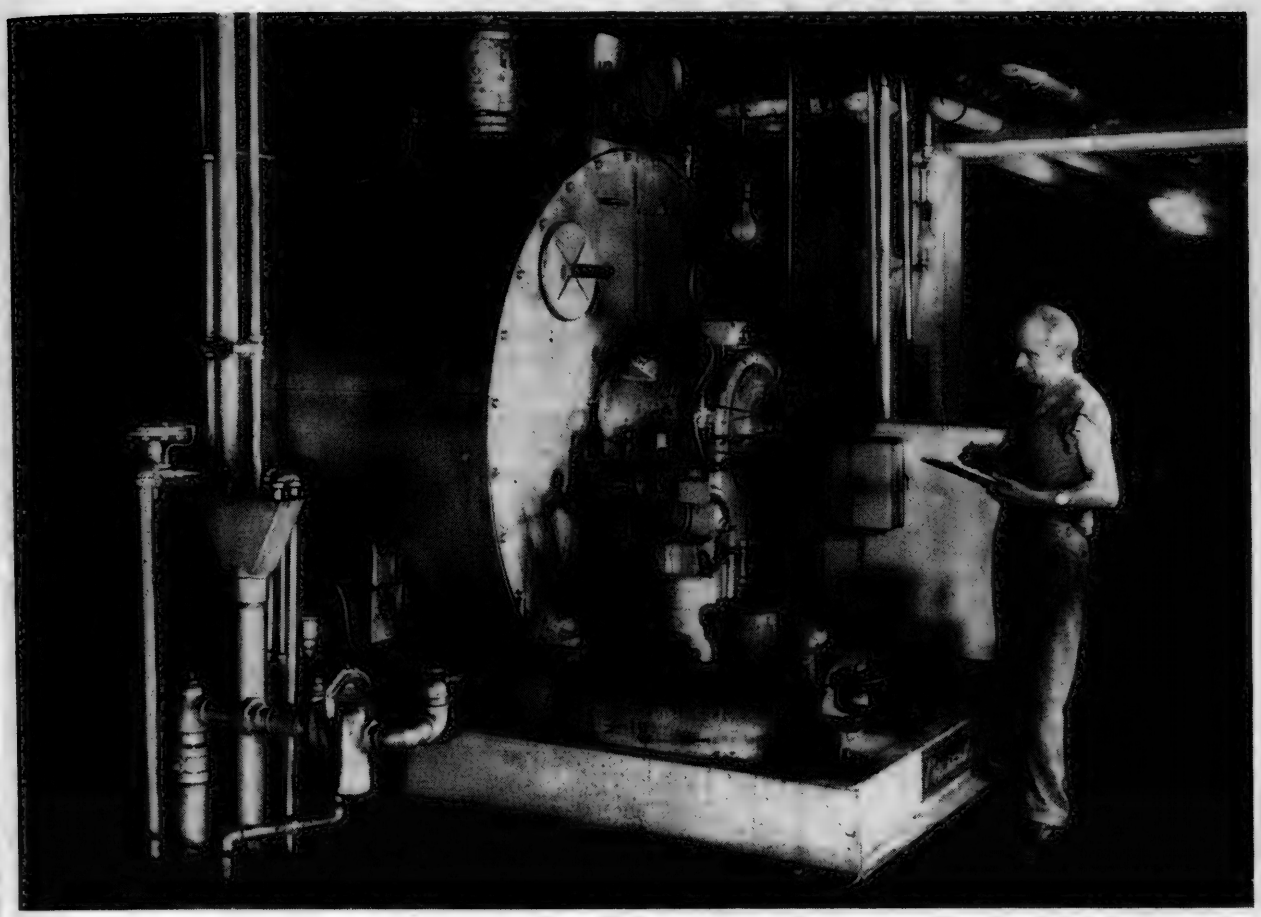
Cooling Studies in a Research Home, by W. S. Harris and P. J. Waibler, Urbana, Ill.

Analogue Computer Analysis of Residential Cooling Loads, by T. N. Willcox, C. T. Oergel, S. G. Reque, C. M. toeLaer and W. R. Brisken, Bloomfield, N. J.

The Operating Cost of Residential Cooling Equipment, by S. F. Gilman, L. A. Hall and E. P. Palmatier, Syracuse, N. Y.

*Presentation by title.

IN HOTELS



Powermaster® Excels in Operating Efficiency!

For example: This large hotel in an Eastern city is supplying heat and hot water for its 300 rooms with this 250 HP *Powermaster* Packaged Automatic Boiler.

High fuel economy at all loads is one reason why *Powermaster* is a byword for operating efficiency among the men who select, install and operate boilers for hotels as well as for institutions, churches, housing projects, all types of buildings . . . and industrial plants.

Other *Powermaster* advantages include: Cost-saving installation, space-saving compactness, fast steaming, hospital-clean operation, dependability, maintenance-saving accessibility, fully automatic operation and safety controls and smokeless combustion.

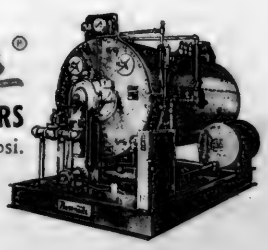
If you're in the market for a boiler, remember—Steam costs go down where *Powermasters* go in. Get the cost-saving story on *Powermaster*. Send now for latest descriptive bulletin.

O&S

Powermaster®

PACKAGED AUTOMATIC BOILERS

In sizes to 500 HP; pressures to 250 psi.



ORR & SEMBOWER, INC. • Established 1885 • **Morgantown Road, Reading, Penna.**

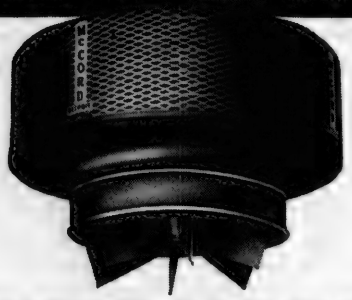
McCORD

HEATING AND AIR CONDITIONING PRODUCTS

HORIZONTAL TYPE UNIT HEATERS

Modern design—top performance—thousands in use—dependable heat. All copper coils to resist corrosion — individual tube expansion — most rugged construction — quiet operation — easy installation—standard motors with standard bases. Sizes to 272,000 B.T.U. capacity.

VERTICAL TYPE UNIT HEATERS



A proven heating unit—all copper coils to resist corrosion. McCord spiral tube fin construction creates air turbulence without undue restriction. Improved fan delivers large volume of air, with minimum air noise. All McCord heaters are guaranteed for use with 150 lbs. saturated steam pressure. Sizes to 575,000 B.T.U. capacity.

McCORD CORPORATION
DETROIT 11, MICH.

COPPER SHORTAGE

was induced by controls and has no substance in fact, industry leader says.

Developments during the past two years have confirmed the belief that the much heralded copper shortage has no substance in fact, according to Mr. Richard C. Diehl, president of the Copper & Brass Research Association. In view of the publicity given to an anticipated shortage of copper during the Korean emergency and the official urge at that time to substitute other materials for copper, it is important to emphasize at this time, according to Mr. Diehl, that copper is in ample supply.

• **CONTROLS.**—The indication now is that the temporary shortages that developed during the Korean episode were largely the result of dislocations induced by the various controls and restrictions imposed at the time. However, such transitory shortages as may have been experienced in certain industries during that period, should not have been made the basis for the erroneous assumption that copper would be in short supply indefinitely.

• **SUPPLY.**— Mr. Diehl, who is also president of Chase Brass & Copper Co., Inc., emphasized that there is every prospect that copper will be plentiful for many years to come. Beginning in 1950 all of the leading copper producers initiated extensive programs for increasing mine production. The supply of copper from all sources increased in 1952 and again in 1953. Within two or three years the available supply if needed will exceed the present by at least 15%.

At the same time, the fabricating capacity of the copper and brass mills has increased substantially both by additional facilities and improved methods and such expansion of capacity is continuing.

COAL INDUSTRY PROBLEMS

discussed at meeting of governors and officials of 16 states. Oil imports hit.

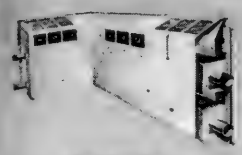
The governors of ten of the nation's principal coal producing states and representatives of six others met in Washington April 26 with spokesmen for anthracite and bituminous coal operators and the United Mine Workers of America, and spent the afternoon discussing problems presently confronting the industry. The meeting had been called by Pennsylvania's Governor John S. Fine who presided.

Other governors in attendance were those of Colorado, Illinois, Indiana, Kentucky, North Dakota, Ohio, Oklahoma, Utah and West Virginia. Official representatives of the governors of Alabama, Kansas, Missouri, Tennessee, Virginia and Wyoming were also present.

Senator Malone of Nevada, whose committee has been conducting investigations of the supply of strategic minerals, spoke briefly.

• **OIL.**—Mr. Tom Pickett, Executive Vice President of the National Coal Association, discussed the impact of foreign imported residual oil on the coal industry, and the need for governmental restrictions in the interest of

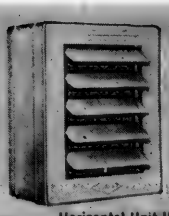
(*Continued on page* 148)



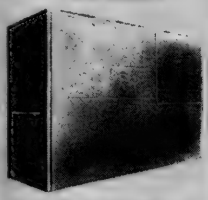
Wall Radiation

Baseboard Heating

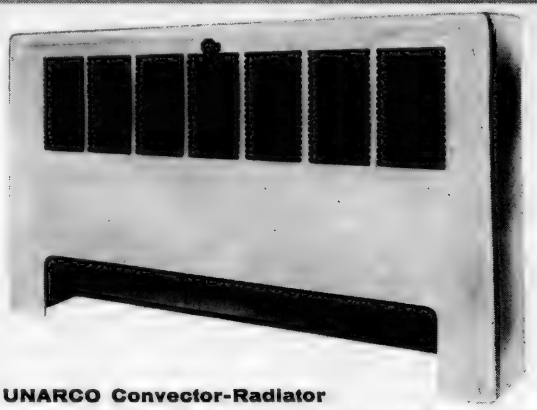
Down Blow Unit Heaters



Horizontal Unit Heaters



Model AEC Air Conditioners with self-contained water saver



UNARCO Convector-Radiator

- Snap-on front panel • easy-to-clean • Knock-out end panels for easy installation • Cast bronze headers for added heat transmission
- 18-gauge steel front and top • Directional die-formed louvers
- Simple damper control • Carefully rounded corners for safety
- Attractive modern design
- Ideal for homes, offices, institutions, industrial and commercial uses

Furnace Air Conditioners

Highboy Air Conditioners

Mobile Air Conditioners

year 'round weather conditioning*

UNARCO®

World's finest heating and cooling products in a complete range of types and sizes

• Priced to sell • 36 sales offices

Get the UNARCO facts before you buy

*Trade Mark

UNION ASBESTOS & RUBBER COMPANY
332 South Michigan Blvd. • Chicago 4, Illinois

Gentlemen:
Without obligation, please send illustrated literature on the following units:

- ☐ Convector-Radiators
- ☐ Baseboard Heating
- ☐ Wall Radiation
- ☐ Horizontal Unit Heaters
- ☐ Down Blow Unit Heaters
- ☐ Highboy Air Conditioners
- ☐ Furnace Air Conditioners
- ☐ Mobile Air Conditioners
- ☐ Model AEC Air Conditioners with self-contained water saver

Please have representative call ☐

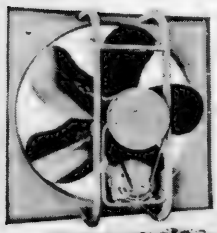
Name_____
Position_____
Firm_____
Street_____
City_____ County_____ State_____

UNION ASBESTOS AND RUBBER COMPANY
332 South Michigan Blvd. • Chicago 4, Illinois

When planning your Ventilating Systems...

Get all the Facts!

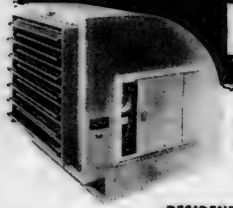
Each new job presents different cooling and ventilating problems that we can successfully solve for you . . . Write us for complete data on the hundreds of possibilities offered in the wide range of styles, sizes and capacities of Chelsea Fans—ask for Data Sheets #600 or, for technical assistance, call our engineers.



FOR GENERAL VENTILATION Type IND

DUCT BOOSTER Non-Overloading Type PLDX

CHELSEA FANS



ROOF PENT-HOUSE UNIT Type PH

RESIDENTIAL ATTIC FAN Permanent installations for homes of any size.

Certified Ratings

Every Chelsea fan has a PFMA Certified Rating. Sturdy, all-steel construction for long and dependable service.

CHELSEA

CHELSEA FAN & BLOWER CO., INC.

PLAINFIELD • NEW JERSEY

MANUFACTURERS OF INDUSTRIAL & HOME VENTILATING EQUIPMENT

COAL INDUSTRY PROBLEMS

(*Continued from page* 146)

the preservation of a strong industry and its transportation facilities.

Mr. F. W. Earnest, Jr., President of the Anthracite Institute, in further clarifying the coal industry's position on the subject of oil imports and other matters, posed and then answered ten specific questions, including one on the significance of "free trade" and its current and potential abuses.

• **LEWIS.**—Governor Fine next introduced United Mine Workers of America President John L. Lewis, who pointed out that the coal industry is not subsidized and does not want to be, and that what it desires is to be allowed to prosper in times of peace in order that it may be able adequately to meet the nation's emergency requirements in time of emergency. He joined with spokesmen of management in urging the adoption of a sound national fuels policy.

Secretary of the Interior Douglas McKay assured the conference of the federal government's awareness of the critical problems confronting the industry and its desire to continue to be actively helpful in their solution.

There followed a general discussion among the governors and others present as to the problem of the tide of foreign oil reaching the Atlantic Seaboard which is displacing coal at an alarming rate and causing wide unemployment, with coincidental injury to the eastern railroads and many domestic oil producers.

The governors formed a permanent committee to continue study of the problems of the coal industry and formulate suitable recommendations for their solution.

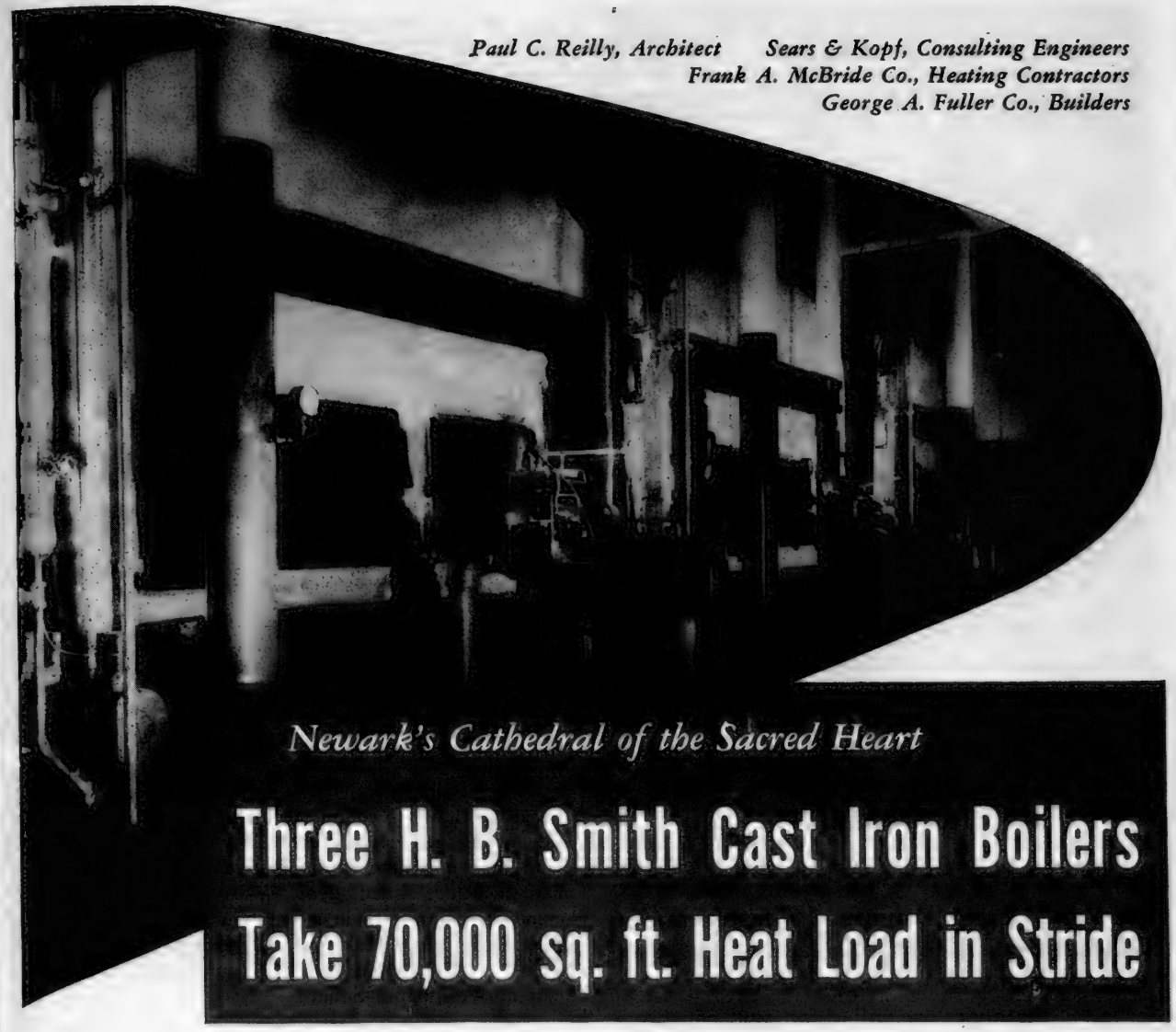
LEAK DETECTORS

help to avert severe water shortage in New York City.

Water Doctors is another name for the crews of technicians who go about applying their highly sensitive aquaphones and geophones to city streets in an effort to detect underground leaks. Because the city of New York faces the possibility of a severe water shortage during the next few months, 16 crews of technicians are working night and day in search of wasteful underground drain-offs. The billion gallons of water consumed daily by New Yorkers flow through some 5,479 miles of main pipe covering an area of 359 square miles. A few minor leaks can mean a loss of thousands of gallons daily, and with the city's reservoirs only 69% full at the end of April (a time when they are normally over-flowing), every gallon of water must be conserved if New Yorkers are to get through their summer without a severe crisis.

• **EXPERTS.**—Job of the technicians is a difficult one Their sensitive listening equipment sounds out an underground leak, but only the experienced ear can distinguish between the many underground sounds these instruments pick up. D. L. Gallagher, manager of the Public Works Division of Worthington Corporation, builders of equip-

(*Continued on page* 150)



Paul C. Reilly, Architect *Sears & Kopf, Consulting Engineers*
Frank A. McBride Co., Heating Contractors
George A. Fuller Co., Builders

Newark's Cathedral of the Sacred Heart

Three H. B. Smith Cast Iron Boilers Take 70,000 sq. ft. Heat Load in Stride

The construction of The Cathedral, which started more than fifty years ago, posed a problem of heating and ventilating.

Requiring consideration were the great height of the nave and the large lateral occupied area which in addition to other spaces, totaled 70,000 square feet E. D. R. heating load. To supply the necessary heat and assure balanced distribution called for a high degree of engineering ingenuity — brilliantly met by Consulting Engineers Sears & Kopf.

Assigned to the task of heat generation were three H. B. Smith No. 60 Boilers — the largest three-boiler installation since the Company's founding in 1853. Each boiler consists of 30 cast iron sections, and each boiler is fired with power type gas burners. The over-all result is the comfortable heating of the huge interior. And, as is typical with the use of H. B. Smith Boilers, outstanding efficiency and fuel economy are achieved, with stack temperatures remaining consistently under 400°.

The H. B. Smith line of cast iron boilers for heating and domestic hot water permits a technical approach to any heating problem you may encounter. Broadest in the world, this line contains the concise, specific answer for small homes or multiple-unit applications.

H.B. Smith

R

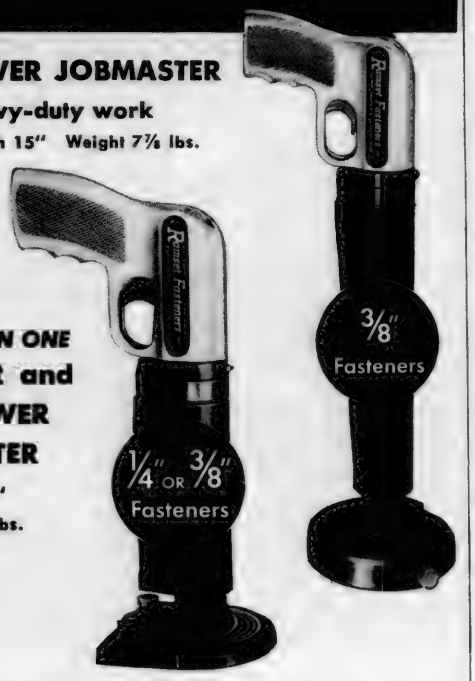
For all-around utility... the BEST BUY is Ramset

FASTENING SYSTEM

SUPER-POWER JOBMASTER

for heavy-duty work

Operating length 15" Weight 7⅞ lbs.



TWO TOOLS IN ONE

JOBMASTER and PLUS-POWER JOBMASTER

Length 12"

Weight 6¾ lbs.

For your light-duty anchoring work into steel or concrete, requiring ¼" fasteners, the RAMSET JOBMASTER can't be matched for speed, ease, economy and wide versatility.

If ⅜" fasteners are called for, you can have a PLUS-POWER JOBMASTER, or attach a ⅜" assembly to your standard JOBMASTER. You can interchange from one to the other in a few moments. Thus you have two tools for slightly more than the cost of one, to set either ¼" or ⅜" fasteners.

Where heavy-duty ⅜" fasteners are needed, the great driving power of the new SUPER-POWER JOBMASTER sets them instantly into 1" mild steel or into the hardest concrete.

Write us or ask your RAMSET dealer for on-your-job demonstration of the all-around superiority of RAMSET SYSTEM for ease, speed, utility and economy.

Ramset Fasteners, INC. RAMSET DIVISION, OLIN INDUSTRIES, INC.

12135 BEREA ROAD • CLEVELAND 11, OHIO

FIRST IN POWDER ACTUATED FASTENING — AN Olin PRODUCT

LEAK DETECTORS

(*Continued from page* 148)

ment for water works, points out that the trained ear can detect not only a leak from the sound of normal running water, but can also accurately describe the type of break.

"For example," says Mr. Gallagher, "a jagged break in a water pipe embedded in solid concrete sounds like the thunder of Niagara Falls in the earphones, while a round or elliptical break gives off a less pronounced sound. Water forming a quiet little pool under the street is extremely difficult to detect and only the sharpest ear can distinguish it because there is usually an air space between the pool and the road bed which muffles the sound. These collecting pools are especially dangerous because they can undermine the street and cause a cave-in, damaging electrical, telephone, steam and subway installations. The noisier break which indicates the water is draining off freely is less likely to cause other damage, but of course, it is extremely wasteful."

• **NOISE.**—Leak hunters in New York City are confronted with quite a few problems. The business of detecting underground drain-offs is confined to the early morning hours before dawn when the city is quietest. Trying to detect a water leak during the day in the midst of rumbling traffic, subways and machinery would be like trying to hear a pin drop during a hurricane. When working along the waterfront, the technicians must know when the tides are coming in or going out because high tide muffles leaks considerably. They must also be familiar with the many underground streams throughout Manhattan, such as Minetta Brook in Greenwich Village which comes to the surface in a fountain in the lobby of the Holly Hotel. A mistake in analyzing the gurgle of the brook and the gurgle of a leak could mean digging up half of Washington Square.

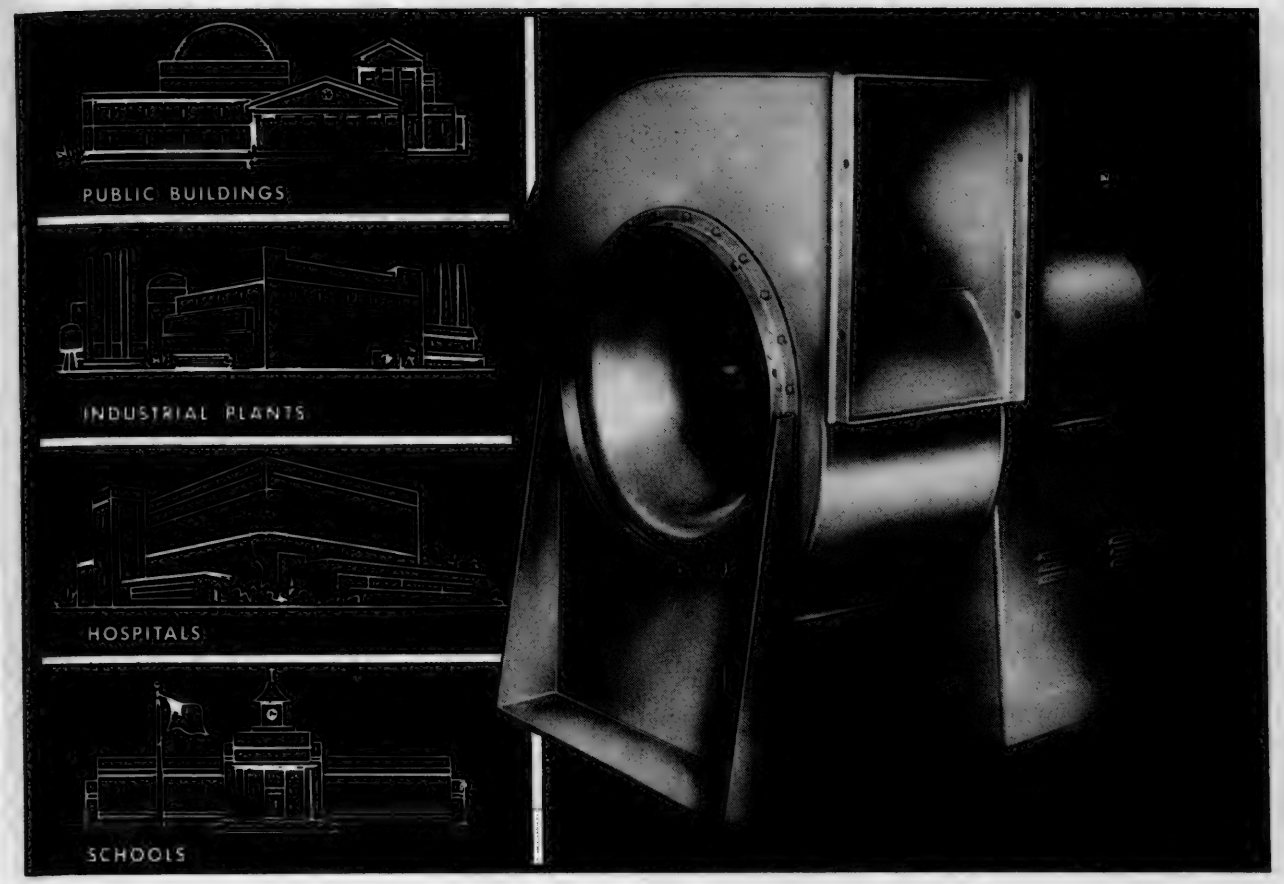
LONDON LETTER

(*Concluded from page* 109)

accustomed to calculating conduction and convection heating, radiation brings some unpleasant surprises. Of the total heat emitted from a radiating source, only a portion reaches the comfort-seeking human body or receiver. The ratio between received and emitted heat is the shape factor.

Now that it is generally recognized that the human body prefers to lose its 400 or so Btu per hour of metabolic heat mainly by convection; that is, likes a high MRT and cool air, heating by low temperature radiation must come more and more to the fore. Expensive errors in its application can be avoided by calculation, but the calculation is complicated and laborious. Gradually the subject is being simplified by means of diagrams and mathematical short-cuts as it is discovered where the approximations can be made safely.

Fischer has not only produced an excellent summary of the present state of the mathematical theory, but he has taken the trouble to convert all the units into deg F, ft, lb, and Btu in his interpretation of the German work.



Quiet, Compact Westinghouse Ventilating Sets are Seven Ways Better!

In industrial plants, schools, hospitals, public buildings—wherever quiet, low-cost, reliable ventilation of small to medium areas is required, check the features of Westinghouse Ventilating Sets before you specify. Only Westinghouse offers all seven of these benefits:

1. *Low power consumption*, thanks to wheel designs that combine top efficiency with large capacity
2. *Simple installation* because these compact fan-motor units are miserly with space, easy to set up
3. *Extra-quiet operation* because carefully designed inlets give smooth, steady airflow
4. *Convertible air discharge*—as you want it, when you want it, even after initial installation
5. *Weatherproof covers* that keep these units dry and clean when mounted outdoors
6. *Trouble-free operation* that cuts maintenance, permits installation in out-of-the-way locations
7. *Exclusive warranty* that only Westinghouse-Sturtevant can offer because of undivided equipment responsibility

Westinghouse Ventilating Sets are available now either direct-connected for volumes from 150 to 3200 cfm, or v-belt driven (illustrated above) for volumes from 375 to 14,400 cfm. Wheel diameters range from 6 to 30 inches. Ask your Westinghouse-Sturtevant representative for further details. Get catalog 1160. Write: Westinghouse Electric Corp., Sturtevant Division, Hyde Park, Boston 36, Mass.

WESTINGHOUSE AIR HANDLING

YOU CAN BE **SURE** ... IF IT'S Westinghouse

J-80409

DOWN-DRAFT VIEW
Gate opens outward to relieve down drafts which might affect flame. An optional safety switch closes main gas valve in case of prolonged down draft, thus providing full protection.
UP-DRAFT VIEW
Gate opens inward to regulate updrafts in conventional, proven manner, checking any excess in draft.
field
"MG" Draft Controls
ENGINEERED SPECIFICALLY FOR
GAS
fired industrial and commercial plants
1. Double acting gate opens inward to regulate up-drafts and outward to relieve down-drafts.
2. Adding or taking off weights provides easy-to adjustment for up-draft conditions at time of installation.
3. Control will relieve internal or down-draft pressures of only a few thousandths of an inch.
4. Weights attached to gate itself are factory set to insure extreme sensitivity to down-draft conditions.
5. Corrosion resistant knife edge bearings resting on self-aligning bearing plates assure extreme sensitivity yet long life.
6. Side wings improve the regulation, making the control accurate at all gate positions.
7. Long collar keeps gate out of the path of flue gases — resulting in greatly increased life.
The Field "MG" has met the most rigid municipal requirements for commercial and industrial installations. It is being used with full approval of the nation's leading gas companies in the nation's largest cities. Fully safe, fully proven, it provides for gas-fired installations the same accurate, dependable performance, the fuel economy so long provided by Field Draft Controls for oil and coal fired furnaces. Write for complete information.
FIELD CONTROL DIVISION
of H. D. Conkey & Company — Mendota, Illinois
AFFILIATES: Conco Building Products, Inc. — Brick, Tile, Stone
Conco Materials Handling Division — Cranes, Hoists

ABSTRACTS AND REVIEWS

Publications abstracted in this department should be ordered direct from publisher.

HOW TO WELD METALS

All of the various welding processes and their uses are discussed in Metals and How to Weld Them, by T. B. Jefferson, editor of The Welding Engineer and The Welding Encyclopedia, and Gorham Woods, metallurgist. The authors have simplified the subject of metallurgy to make it readily understandable. One of the objectives of the authors was to make the book understandable even by high school students, and yet to make it valuable even to the graduate engineer.

After discussing the various metals and the physical properties of metals, there are separate chapters on how these metals are welded. Included are chapters on the welding of low carbon steel, medium carbon steel, high carbon steel, alloy steel, cast iron, stainless steels and high chromium alloys, austenite manganese steel, and non-ferrous metals and alloys.

All interested in welding should find this a good reference book covering techniques and various phases of this subject.

Metals and How to Weld Them, by T. B. Jefferson and G. Woods. Cloth bound, 5¾ x 8½ inches, 322 pages. Published by The James F. Lincoln Arc Welding Foundation, Cleveland 17, Ohio. Price, $2.

• • •

DESIGN OF ALUMINUM DUCT SYSTEMS—Thirty-two pages of technical information are presented in The Design of Aluminum Duct Systems, by F. W. Hutchinson, professor of mechanical engineering, University of California, Berkeley, Calif. It is based on research conducted by the author. The use of aluminum for ducts results in less friction loss as compared with a galvanized iron duct, permits transporting more air through smaller ducts, and because of high reflectivity of bare aluminum, it reduces radiant heat losses or gains and permits delivery of required heating or cooling effect with less loss and less total air volume. A section gives detailed step-by-step procedures and recommendations for sizing round or rectangular ducts for heating, ventilating and air conditioning. Kaiser Aluminum & Chemical Corp., 1924 Broadway, Oakland 12, Calif.

ECONOMICAL OPERATION OF THE SMALL STEAM PLANT—A booklet has been issued for steam generating plants up to 300 hp rating covering Economical Operation of the Small Steam Plant. It presents the latest research information. Prior to the publication of the booklet, it was reviewed by a selected group of twenty-five persons including BCR advisory committee members, and other combustion engineers and executives. This is the third publication in a series on aids to industry and covers boiler efficiency, firing, automatic controls, and maintenance. Bituminous Coal Research, Inc., 2609 First National Bank Building, Pittsburgh 22, Pa. Price, 50 cents.

HEATING AND VENTILATING'S Ad-Digest SERVICE

Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.

NOTE: While every attempt is made to list all advertisements, those which are received after the published closing date may not appear. The Index of Advertisers lists all the advertisements in this issue.

AIR FILTER GAGES. Page 155. A dirt clogged filter in air circulating or air conditioning systems lowers efficiency and costs money. This air filter gage, which is easy to read, and has minimum maintenance, measures the resistance that air meets in passing through the filter and calls your attention to a filter that needs attention. Bulletin available.....Item 201

AIR DIFFUSERS. Page 158. Slender, continuous line diffusers ideal for installation in shallow lighting coves or for air curtaining of glass windows or exposed wall areas. Custom built with the company's patented diffusing vanes. These diffusers fit inconspicuously into your plans. Catalog available.....Item 202

PACKAGE STEAM GENERATOR. Page 21. A packaged boiler for light oil, and light oil and gas, heavy oil, heavy oil and gas, natural or manufactured gas. Designed for factories, stores, hospitals, apartments, office buildings, wherever high efficiency heating and power are a special consideration. Bulletin available.....Item 203

UNIT HEATERS. Page 146. Horizontal type steam and water unit heaters with capacities up to 272,000 Btu per hour and vertical types up to 575,000 Btu per hour capacity. .....Item 204

REGRIGERATION. Page 42. The William Penn Hotel in Pittsburgh is served in five ways by this company's refrigeration equipment. These include air conditioning, cooling drinking water, refrigeration of foods, freezer service, and making ice. Hotel has used the maker's equipment since 1936 and finds it efficient and dependable .....Item 205

DRAFT CONTROL. Page 152. Draft controls engineered specifically for gas-fired industrial and commercial plants and which meet the most rigid municipal requirements. Information available. ..... Item 206

PIPE INSULATION. Page 27. An unusual pipe insulation which installs itself in that it is poured on underground pipe, tamped and backfilled, and the job is insulated. The heat in the pipe fuses the insulation to the pipe resulting in an underground pipe insulation at low cost. Available in three grades. Literature available. ..... Item 207

AIR CONDITIONING. Page 7. As with turtles, slow speed means long life in air conditioning units. Slow speed is a feature of this company's line of compressors, conditioning units, and self-contained air condensers. .....Item 208

AIR FILTER. Page 16. A new high-low velocity 1-inch filter which holds seven times as much dirt as ordinary filters, gives sustained high performance with low-pressure loss, and can be used at either high or low velocity. Information available. .....Item 209

AIR CONDITIONING. Page 68. A system of individually controlled units for multi-room buildings and which heat in winter and cool in summer. Same simple piping circuits supplies chilled water in summer and hot water in winter and no duct work is needed. Information available. Item 210

DIAL THERMOMETERS. Page 164. These thermometers are made in 3 types—rigid stem, wall-mounted, and flush-mounted to meet all requirements. Technical bulletin available. .....Item 211

COPPER TUBE. Page 44. This copper tube was chosen for radiant heating the Sacred Heart Cathedral in Newark, N. J., because it is corrosion-resistant and can't clog with rust, ever. It can be bent by hand and fewer joints are needed because it comes in long lengths. .....Item 212

PACKAGED BOILERS. Page 160. Real savings in installation and operation with this line of packaged boilers in twenty sizes. They are set on the concrete floor and require no special foundation or heavy stack. Bulletin available. .....Item 213

HEATING PUMPS. Page 51. This company, which makes a line of heating pumps, recently had occasion to rush a shipment of ten of its boiler feed pumps to an east coast air base, the pumps being picked up by the U. S. Air Force. Proven performance is the answer. .....Item 214

AMMONIA COMPRESSOR. Page 64. High operating efficiency and lighter weight make this modern unit the talk of the industry. It has the same high operating efficiency and versatility as its lower speed counterparts. Ranging in capacities from 18 to 150 tons, the new units can be used as high-stage or booster machines. .....Item 215

FIRE PROTECTION EQUIPMENT. Page 160. A proved reliable, economical line of interior fire protection equipment. Line includes 480 cabinets alone.....Item 216

VENTILATING SYSTEMS. Page 148. Each ventilating job presents problems that can be solved by a company having a comprehensive line, such as this one which makes axial flow fans, roof penthouse units, attic fans, duct boosters and other equipment. Data sheets available.....Item 217

CHILLERS. Page 166. Controlled velocity chillers with improved heat transfer, no oil logging or slop over, and rapid response to thermal expansion valves. Full details and application data available....Item 218

AIR CONDITIONERS. Page 164. An upright air conditioner built to perform true air conditioning quietly and efficiently. Available in capacities from 3 to 15 tons. ..... Item 219

COOLING TOWERS. Page 141. How pressure creosoting adds years of life to this company's cooling towers. Constantly wetted wood decking in a cooling tower is subject to attack by fungus and marine parasites. Wood used in this company's towers is protected against these enemies. ..... Item 220

AIR CONDITIONING EQUIPMENT. Page 36. This line includes room air conditioners, packaged units, residential cooling and heating units, evaporative condensers and condensing units. Every product is built with quality material and workmanship. With this line you can handle any installation for home, office, store or factory. Information on franchise available. ..... Item 221

COPPER TUBE. Page 123. According to a large contractor in Missouri the many desirable characteristics of this line of copper water tube make it the ideal material for radiant panel heating and prefabrication is easier and time and labor are saved. Advantages include easy to bend, handy lengths, solder or compression fittings can be used, and non-rusting characteristics. ..... Item 222

AIR CONDITIONING UNITS. Page 181. Air conditioning units with five outstanding features, including muggy air control, blow-through design and anti-sweat construction, quiet operation and graceful lines. Bulletin available.....Item 223

DIRECT FIRED HEATERS. Page 162. Direct fired heaters give heat when and where you need it at the flick of a switch which saves on low initial cost and have fully automatic controls. Available for gas, oil, coal or dual gas and oil. Information available. .....Item 224

FANS AND BLOWERS. Page 49. Celebrating the 75th year of manufacture of its line of centrifugal fans and blowers featuring dependable ratings, automatic inlet vanes, and certified ratings for both squirrel cage and non-overloading fans. Bulletins available. .....Item 225

REGISTERS AND GRILLES. Page 41. A line of grilles which meters air flow accurately with increased directional flow in designs which eliminate possibility of tamperng or accidental changes. Stream-

Enter numbers corresponding to the advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

PLEASE SEND US MORE INFORMATION

Enter below item numbers on which you wish further information.

Item No.....	Item No.....	Item No.....	Item No.....	Item No.....
Item No.....	Item No.....	Item No.....	Item No.....	

PLEASE PRINT June AD-54

Name .....**Title** .....

Firm .....

Nature of Firm's Business .....

Street .....

City .....**Zone**..... **State**.....

This card is void after Sept. 1, 1954

Ad-Digest SERVICE

lined valves of extruded aluminum are individually adjustable. Frame is fully enclosed for easier, safer installation. Available in any size with choice of vertical or horizontal louvers. Bulletin available. ---------- Item 226

AIR CONDITIONING AND FLOW CONTROLS. Pages 10-11. Precision control of air conditioned areas in a modern $12,000,000 plant by a pneumatic control system is described. Flow of heating and cooling media and vacuum used for various processes is controlled by a line of special valves by the fan manufacturer. Installation is in a large pharmaceutical center. ---------- Item 227

HEATING SPECIALTIES. Page 62. Three Chicago suburbs have equipped new schools with this line of valves and traps in steam heating systems. Packless radiator valves and radiator traps went into the heating systems, which involved both direct and indirect radiation. Catalog available. ---------- Item 228

STEAM TRAPS. Inside front cover. Savings in price, installation cost, and maintenance are assured with the installation of traps featuring long-lasting mechanism in both medium and high pressure traps. A wide choice of body styles and stainless steel wearing parts are features of the line. Steam trap check list is offered. Catalog available. ---------- Item 229

CAST IRON BOILERS. Page 149. The largest three-boiler installation since the company's founding in 1853 provides balanced heat for a total of 3,000 square feet EDR. Efficiency and fuel economy are achieved with stack temperatures consistently under 400 F. Line includes boilers for small homes or multiple unit applications. ---------- Item 230

PACKLESS CONTROL VALVES. Page 143. More accurate control with durable air-tight packless valves featuring cast aluminum top, durable molded diaphragm, bronze bellows, stainless steel valve stem, and throttling nut assures control without packing maintenance or leakage. Bulletin available. ---------- Item 231

DUCT LINER. Page 66. A glass fiber duct liner that cuts with knife or shears and is applied with regular adhesive to sheet metal prior to forming of ducts in the regular way without special equipment or procedures. High insulation value, sound absorption, corrosion resistance, and light weight are features. Technical bulletin and samples available. ---------- Item 232

PROJECTOR FANS. Page 1. A line of projector fans of high capacity and shaped outlet capable of shooting air distance of 60 feet without ducts at velocities up to 5,780 fpm. Fan is a 14-blade axial flow pressure fan built into a nozzle shape housing. Suitable for cooling workmen or equipment. Furnished with wall-mounting brackets or on wheeled stands. In diameters from 18 to 30 inches. Bulletin available. ---------- Item 233

COMMERCIAL RADIATOR TRAPS. Page 52. A record of 20 years of service of 110 steam traps used in commercial greenhouses is described. Maintenance cost on the traps was 0 for the first 15 years of service and current costs are less than 4 cents a trap per year. The user is enthusiastic. Bulletin on series available. Item 234

AIR CONDITIONING EQUIPMENT. Page 14. Fans, heating and cooling coils, air conditioning units, and heating and ventilating units of this manufacturer are featured in the 21-story home office of a large insurance company. Dependable service and performance of the equipment is commended by mechanical contractors. Company engineers ready to meet special problems. ---------- Item 235

FUEL OIL HEATER. Page 153. An indirect gas fired fuel oil heater for use with No. 6 oil burner layouts can be applied to all types of oil fired apparatus and one heater can serve many burners. Unit is independent of system it is serving and requires no steam piping. Bulletin available. ---------- Item 236

VENTILATING FANS. Page 151. A line of centrifugal ventilating fans featuring low power consumption, simple installation, quiet operation, adjustable discharge, and weather proof covers is available in a complete line of sizes from 150 to 14,000 cfm. Wheel diameters range from 6 to 30 inches. Catalog available. ---------- Item 237

EVAPORATIVE WATER COOLERS. Page 31. For cooling jacket water, oil or other liquids, these evaporative water coolers with three circulating dampers offer automatic temperature control and efficient use of cooling water in a closed system. Units using very little make up water are available in capacities for cooling from 20 to 600 gpm of liquid and are built in 3 basic, demountable sections. All parts, pumps and fans are included. Bulletin available. ---------- Item 238

HEAT EXCHANGER TUBING. Page 35. Seamless and welded carbon alloy and stainless tubing for condensers and heat exchangers are constructed of a variety of steel alloys for services from mild to specialized application where surface conditions are extreme. In addition to standard tubing, alloys are available suited for handling neutral salt solutions or for operation in corrosive environments at high temperatures. Bulletin available. Item 239.

SEWAGE EJECTOR. Page 157. A submersible sewage ejector engineered for underground lift stations operates with a bladeless impeller which will pump all sewage, even rags, in capacities from 35 to 300 gpm with heads to 45 feet. No pump house is required. Bulletin available. ---------- Item 240

HEATING AND COOLING EQUIPMENT. Page 17. A complete line of heating, air conditioning and water heating equipment is offered at attractive profit margins. High quality and company services are featured. Performance protects your earnings. Franchise inquiries invited. Item 241

AIR CONDITIONING UNITS. Page 32-33. A new line features 20 new models of a factory built air handling unit in capacities from 600 to 29,000 cfm for flexible application and easy installation. New fans assure quiet, efficient operation with low outlet velocity, about 1,500 fpm. Multiple zone installations can be designed with any or all of 24 practical combinations of heating, cooling, humidification, dehumidification, ventilating and filtering. Three types of heating coils for steam or hot water, five types of cooling coils for chilled water, well water or freon. Three types of humidifiers, three kinds of filters. Low maintenance and positive drainage combine with simple installation. Rated by fan performance in the unit. Literature available. ---------- Item 242

AUTOMATIC FILTER. Page 40. An automatic filter that renews its medium automatically for continuous high efficiency and low maintenance cost. Medium consists of a 2-inch thick mat of glass fiber material sprayed with a non-flammable adhesive, and mounted in roll form at the top of the filter. Medium moves as a continuous curtain down the face of the unit and is rerolled on motor driven spool at the bottom. Pressure differential switch regulates movement of curtain so that constant pressure drop is assured. One roll should last one year per 10,000 cfm of capacity. Bulletin available. ---------- Item 243

CONTROL SYSTEMS. Back cover. Room thermostats, damper controls, water valves and other control components make up a specially designed all-weather comfort control system for a large insurance company. In addition to individual room controls, a central station panel gives visual control of operation throughout the system. Planned systems are designed specifically for each individual installation. Literature available. ---------- Item 244

AIR CONDITIONING EQUIPMENT. Page 28. Evaporative condensers, cooling towers, unit coolers, heat exchangers, oil separators, receivers, pipe coils, packaged liquid chillers to 225 tons, heat pumps, remote room conditioners, and other components make up a complete line of air conditioning and refrigeration equipment. A 60-ton Florida church installation features a hot dipped galvanized cooling tower constructed to withstand salty east Coast air with minimum maintenance. Manufacturer has served the industry for 34 years. ---------- Item 245

AIR CONDITIONING SYSTEMS. Page 35. Two forms of central station air conditioning systems are combined to provide efficient, economical cooling and heating for a large Newark, N. J., building. Individual air conditioners serve a perimeter system for outside rooms with chilled water for cooling and warm water for heating. Inner areas are served by a central duct system with horizontal ducts used to circulate conditioned air. A complete air conditioning service is offered with equipment for every system of modern air conditioning. ---------- Item 246

AUTOMATIC ZONE CONTROL. Pages 22-23. Centralized automatic controls provide low cost, effective control of multiple zone air conditioning systems. Control centers can be supplied to any air handling unit to heat or cool one or more zones using either hot water or steam and chilled or direct expansion coils. Control unit serves as central junction box with pre-wired accessories and numbered terminal strips for connecting all electrical components. Wiring is simplified, installation costs decreased. ---------- Item 247

COPPER TUBES. Page 9. For new installations or replacement piping, copper tube can lower your plant piping costs. Long life, light weight, long lengths, and easy bending on the job all contribute to big savings. Copper tube resists corrosion and guards against contamination. Smooth interior means smoother flow. Copper tube with solder-type fittings can be taken down, moved, or have new connections cut in faster than with threaded pipe. Literature available. ---------- Item 248

NEW HEATING SYSTEM. Page 53. A new design in central heating offers continuous modulated heat with individual room control for gas, oil or coal-fired installations. A thermostat in every room actuates steam supply and air circulating devices so that each room can be operated at a selected temperature. Unused rooms can be kept cool while other rooms are warm. Individual office temperatures can be regulated to suit individual needs. Literature available. ---------- Item 249

COOLING TOWERS. Page 131. A complete line of natural draft and mechanical draft cooling towers and industrial spray nozzles. Nozzles are especially designed for long life, low maintenance and high efficiency with whirling chambers for best dispersion. Towers feature quiet operation for hotel or hospital installations. Controlled air movement makes units independent of natural breezes. Only dry air

Postage Will be paid by Addressee

No Postage Stamp Necessary If Mailed in the U. S.

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 53, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

HEATING AND VENTILATING

148 LAFAYETTE STREET

NEW YORK 13, N. Y.

AD-DIGEST SERVICE

passes through the air propulsion assembly. Capacities from 1 to 108 tons in three size ranges. Bulletins available. ----------Item 250

SCHOOL HEATING SYSTEM. Page 2. How an 11 room school was constructed at a cost of $13.10 per square foot with less than 7½% of the construction cost allotted to a fully controlled and modulated steam heating system is described. All components of a true perimeter system including convectors, traps, valves and moderating controls are available from a single supplier in an integrated design which requires no blowers or fans, no buried or inaccessible piping. System is controlled by the weather. Information available. ----------Item 251

POWDER ACTUATED FASTENING. Page 150. For anchoring work into steel or concrete, requiring ¼ inch fasteners, the standard powder-actuated stud fastener is a quick, convenient tool. Where heavy-duty ⅜ inch fasteners are needed, the greater driving power of a new, larger fastening tool sets studs instantly into 1 inch mild steel or into the hardest concrete. Attachment for heavy duty can be applied to standard model. Literature available. ----------Item 252

AXIAL FLOW FANS. Page 25. Corrosive air removed quickly by installation of axial flow fans in duct work. Compact installation at a new zinc and cadmium plating plant described. Installation in duct saves floor space, installation cost, and structural alterations. Axial flow fans available in 136 models all with adjustable blades for volumes up to 300,000 cfm. and pressures to 11 inches w.g. Bulletin available. ----------Item 253

RELIEF VALVES. Page 168. A complete line of relief valves assures emergency temperature and pressure relief for hot water supply or storage systems in domestic, commercial, or industrial installations. Valves available in discharge capacity ratings from 150,000 to 3,000,000 Btu per hour. Folder available. ----------Item 254

AIR HANDLING EQUIPMENT. Inside back cover. Fans and air washers are still in operation after 29 years in a Chicago hotel. Users can rely on quality of this line. Nationwide application engineering service. ----------Item 255

STEEL PIPE. Page 37. A most efficient and dependable pipe and tubing were chosen for Television City, CBS west coast studios. For over 60 years this pipe has been accepted standard for conventional hot water and steam heating systems, fire control and plumbing lines. Ideal also for modern radiant heating and snow melting installations. Uniform, dependable performance. ----------Item 256

VENTILATORS. Page 163. Over half a century of practical experience goes into designing, engineering and manufacturing ventilators for all applications from atomic plants to zoos. Line includes fan and gravity ventilators, louvers, and sheet metal specialties. Catalog available. ----Item 257

COOLING TOWERS. Page 71. Induced draft cooling towers designed to save water, operate with a centrifugal fan and feature redwood wetted deck, galvanized construction throughout, engineered for long life either outdoors or indoors. Five sizes from 3 to 16 tons. Catalog available. ----------Item 258

REMOTE AIR CONDITIONERS. Page 67. Remote room air conditioners in 4 sizes, 6,000 to 18,000 Btu per hour feature two speed fan control on horizontal or vertical models supplied with water or direct expansion coils. Customers appreciate shallow depth front to back, low noise level and easily serviced construction. Literature available. ----------Item 259

GAS VALVE. Page 139. A quiet operating gas valve for all gases in all localities is motor-operated at low voltage and compensates for changes in ambient temperature. Snap-acting opening and positive closing in ½ inch to 1¼ inch sizes. Operates independently of gas pressure. Bulletins available. ----------Item 260

Enter numbers corresponding to the advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

AIR CONDITIONERS. Page 46. Ceiling model air conditioners feature hermetically sealed compressor, throw-away filters, easy installation and easy service for residential and commercial use ideal for attic installation. Horizontal unit can be attached to existing warm air duct work or used as a self-contained unit for free discharge. Exceeds rated capacities in 2 and 3 ton sizes with or without blower. ----------Item 261

STEAM GENERATORS. Page 69. Fully automatic steam generators burn gas, oil or both at efficiencies guaranteed to exceed 80%. Installation is simple and inexpensive. No foundation is required and built-in induced draft eliminates the need for expensive chimney. Sizes from 20 to 600 bhp for pressures to 250 psi or for hot water. Catalog available. ----------Item 262

AIR DIFFUSERS. Page 65. For acoustical suspended ceilings, a panel type air diffuser which fits precisely into the acoustical tile pattern; can be installed as fast and easily as the tiles themselves. Duct and tubing are readily accessible, and flexible duct connections allow placement anywhere on the ceiling or relocation with a minimum of effort without affecting efficiency or requiring change in duct work. Literature available. ----------Item 263

SNOW MELTING. Page 61. An underground garage uses forced hot water heating equipment to keep drives free of ice and snow. Manufacturer supplies engineered steam converters, centrifugal pumps, boiler and tank fittings, and relief valves with dependable performance assured by sound engineering backed up by modern manufacturing methods. General catalog available. ----------Item 264

WATER HEATERS. Page 47. Plenty of hot water when and where you need it and at low cost is available using these water heaters in any type of plant or building wherever there is a steam supply. Water heaters for space heating, process hot water, or general services including snow melting. Available with storage provisions. Bulletins available. ----------Item 265

TANK CAGES. Page 161. Remote reading tank gages feature trouble-free design, without pulleys, springs or other mechanical gadgets, constant accuracy with large vertical scale with interchangeable scales readily removed or adjusted to correct for tank pitch. Gages can be installed easily on tanks above or below ground and up to ¼ mile away. Bulletin available. ---Item 266

ROOF VENTILATORS. Page 166. Streamlined, propeller driven, roof mounted ventilators with the motor out of the air stream, are available in 15 sizes, 254 to 10,280 cfm. Ventilators handle moist air without concern for motor damage or corrosion. Aplication informatin available. ----------Item 267

BITUMINOUS COAL. Page 133. How modern coal equipment saves $9,000 a year and solves the smoke problem at the University of Detroit is described. You may be able to save as much as 20% on fuel alone by replacing outdated equipment with modern stokers and boilers. Bulletin of case histories available. ----------Item 268

Use this Digest to locate and refer to advertisements appearing in this issue of HEATING AND VENTILATING, then fill out and mail the prepaid postcard to request further information.

AIR FILTERS. Page 159. A panel type filter featuring high velocity approach, low space requirement, low installation and maintenance cost, large capacity and long life. Filters are designed for an approach velocity of 530 fpm. Large dust holding capacity assures longer service periods, fewer cleanings per year, lower service charges. Cost comparison chart available. ----------Item 269

DIAPHRAGM VALVES. Page 70. Installation of packless diaphragm valves in a slurry line in a paper manufacturing plant is described. Bonnet and working parts are sealed to line fluid. Independent disc and diaphragm design saves wear. Pliable disc insert seats tightly on foreign particles that cause leakage in ordinary valves. Catalog available. ----------Item 270

AIR DIFFUSING PANELS. Page 56. Low velocity air diffusing panels for heating, ventilating and air conditioning installed flush or completely concealed in the ceiling, distribute air at low velocities by gentle pressure displacement. High ventilating loads can be handled with low room air velocity and accurate control. Literature available. ----------Item 271

ACID-PROOF FANS. Page 153. Exhaust fans constructed of an acid-proof metal throughout including multi-blade rotor are designed to handle acid fumes efficiently, economically and permanently. Bulletin available. ----------Item 272

STEEL PIPE. Page 135. A line of steel pipe features uniformity in ductility, length, threading, weldability, wall thickness, strength, roundness and straightness. Pipe is tough, but not tough to cut, saving installation time. ----------Item 273

COPPER AND BRASS TUBE. Page 25. All production facilities of this company are directed at the manufacture of tube. Distribution system is specialized to deliver the finest tubing in the most efficient way. No bottlenecks, no depleted stocks, no hold up on the job. Uniform high quality. Straight lengths of Type L tube receive extra processing for sag resistance and easy bending without special order or extra costs. ----------Item 274

RADIATION. Page 129. A complete line of radiation equipment including baseboards, wall hung fin tube enclosures, and conventional convectors have both new and improved features that can save time and trouble and insure customer satisfaction. All types of radiation available from a single source. Literature available. ----------Item 275

PLEASE SEND US MORE INFORMATION

Enter below item numbers on which you wish further information.

Item No.....	Item No.....	Item No.....	Item No.....	Item No.....
Item No.....	Item No.....	Item No.....	Item No.....	

PLEASE PRINT June AD-54

Name ..... Title .....

Firm .....

Nature of Firm's Business .....

Street .....

City ..... Zone..... State.....

This card is void after Sept. 1, 1954

Ad-Digest SERVICE

AIR CONDITIONING EQUIPMENT. Page 54. This company's line of spray type dehumidifiers, steam coils, and water coils perform a vital service in the winter and summer comfort conditioning system of modern buildings. A complete line of quality equipment is offered. Details available. ----------Item 276

AIR DIFFUSERS. Page 156. A complete line of air diffusers in both fixed and adjustable outlets with neck sizes from five to 32 inches and capacities from 50 to 13,400 cfm. Round, half-round and square styles are offered in attractive finishes. Selection charts and engineering data available. ----------Item 277

AIR CONDITIONING UNITS. Page 45. Air conditioning units built in sections with a separate section for fans, heating coils, dampers, and cooling coils can be adapted to meet every air conditioning requirement. Units are available in any combination from simple heating or cooling to complete air conditioning, including heating, humidifying, cooling, dehumidifyng, filterng and circulating. Units are built in 8 sizes in either horizontal or vertical types and in capacities from 400 to 15,748 cfm. Catalog available. ----------Item 278

MANOMETER. Page 157. A manometer that is small in size, low in cost and accurate to 3% does four needed jobs. Housing and tube of tough Tenite plastic with logarithmic indicating tube for accurate and easy reading. Two ranges. Suitable for reading static pressure, draft, filter resistance, and velocity from 0 to 7,000 fpm with pitot tube. Package includes all necessary tubing and fittings. Catalog available. ----------Item 279

STORAGE HEATERS. Page 137. A new edition of a hot water storage heater manual helps you select and install hot water storage heaters in the most economical way to provide for peak hot water demands. Manual is expanded and revised to include the most up to date recommendations. A basic reference work for architects, engineers, and contractors. Catalog available. ----------Item 280

MOTOR CONTROLS. Page 20. This company's starters popular for refrigeration and air conditioning service because they are trouble free, have only one moving part with no pivots or pins to corrode and no jumpers to break. Bulletin available. ----------Item 281

STEAM GENERATOR. Page 55. A new small boiler designed as a single package in capacities up to 80 hp for heating or processing steam or hot water features 4 pass firetube construction, silent operation, five square feet of heating surface per boiler horsepower. Burns oil, gas, or combination. Automatic safe operation and easy maintenance. Catalog available. ----------Item 282

DUCT CONNECTOR. Page 155. A one piece fabric and metal duct connector pre-assembled makes quality flexible ducts up to 70% faster than older methods. Wide metal edges are ample to form all types of joints. Stops vibration noise in furnaces, blowers, air conditioners or attic fans. Stapler eliminates costly sewing of fabric. Available in canvass, asbestos or neoprened fiberglass. Literature available. ----------Item 283

PACKAGED AIR CONDITIONERS. Pages 57-58. Packaged units provide low cost air conditioning in a large Washington building. Three independent units on each floor provide 180 tons total capacity in this 30 year old building. Units in 5, 7½ and 10 hp assures flexibility in every application with simplified zoning. Literature available. ----------Item 284

WATER CIRCULATORS. Page 30. A complete flow control system for forced circulation water heating including circulators and flow control valves. Control valve with air tube eliminates air. System makes any job heat better with lower fuel costs. Literature available. ----------Item 285

REMOTE ROOM COOLERS. Page 63. Remote room air conditioners for existing buildings or new construction are available in several types including a new unit especially designed for concealed mounting in furred ceilings, closets, or vestibules. Other units are floor type, ceiling type, and the basic convector type. All 4 types are in three sizes, 200, 400 and 600 cfm for use with chilled water or freon systems. Designed for quiet operation and easy installation. Details available. ----------Item 286

VIBRATION CONTROL. Page 162. Twin rail bases control vibration of fans and motors to keep noise and vibration from reaching working areas through steel deck or through air conditioning ducts. Bases have separate rails for fan and motor and are completely adjustable on the job to take care of any drive center distance, motor position, bolt location or other variables. For vibration control on fans, pumps, compressors, refrigerating and other types of mechanical equipment in both normal and critical operating service, basic isolation recommendations are given in a bulletin. ----------Item 287

COOLING COILS. Page 162. A complete line of air cooling coils from 2 to 15 ton capacities with four rows for residential jobs or six rows for commercial jobs. Precision built to insure top performance and trouble-free service. Bulletin available. ----------Item 288

STEAM GENERATOR. Page 145. A packaged automatic steam boiler serves a large hotel in an eastern city with heat and hot water for 300 rooms from one 250 hp unit. Advantages include fuel economy, installation savings, compactness, quick response, and flexibility with fully automatic operation and safety controls. Bulletin available. ----------Item 289

CORROSION CONTROL. Page 163. A chemical in tablet or granular form which can be used while plant is in operation removes rust, scale, and algae or other encrusting matter from condenser tubes and compression jackets in 1 to 5 hours. A safe, economical method for controlling corrosion or scale. ----------Item 290

EXHAUST FANS. Page 160. Axial flow exhaust fans in housing suitable for mounting in stacks or for motorizing existing ventilators are easy to install, economical to operate. Line includes a remote drive unit for wall installations or handling corrosive fumes. Catalog available. ----------Item 291

HUMIDITY CONTROL. Page 154. A new more reliable air conditioning method with exact moisture control for process or product testing. Cooling and heating functions are made completely separate from adding or taking away moisture. No moisture sensitive instruments are needed. Machine is accessible and control circuits are simple and easy to operate. No solids, salts or solutions to be handled. Bulletin available. ----------Item 292

HEATING EQUIPMENT. Page 24. Oil or gas heating equipment either conversion burners or integral units available in free standing or horizontal suspended styles in residential or commercial sizes. Company points to over 51 years of service in the field of automatic heating and power equipment. Information available. Item 293

UNIT HEATERS. Page 165. Cabinet unit heaters for commercial, industrial and institutional applications available in three styles for steam or hot water systems, overhead horizontal, free standing, or recessed. Capacities are from 32,000 to 115,000 Btu per hour. Heat output is fan propelled. ----------Item 294

STEEL BOILERS. Page 136. Steel boilers for heating any type of large building using oil, gas or coal available in a complete range of sizes. Installations in several large buildings are pictured and described. Information available. ---Item 295

CONDENSATE PUMP. Page 59. A vertical close-coupled pump for low pressure heating systems featuring one piece cast bronze centrifugal impeller, rust resistant cast iron receiver, all operating parts accessible for inspection or replacement, two pole heavy duty float switch. Capacity, 12 gpm at 20 psi at pump discharge. Receiver capacity, 9 gallons. One-third horsepower motor. Catalog available. ---------Item 296

WATER LEVEL CONTROLS. Page 15. Two water level controls will protect any system, one a pump control for low water fuel cut-off and low water alarm, the other a float-operated make-up water feeder for receiving tanks. Suitable for boilers with steam pressures up to 150 psi. Drawing shows simple hook up. Installation and wiring diagrams available. ------Item 297

BOILERS. Page 48. Industrial boilers in capacities from 4,000 to 30,000 pounds of steam per hour and pressures up to 500 psi for operation with oil or gas are completely shop assembled and are installed on a simple concrete slab. More water cooling area per unit of furnace volume than any other boiler of its class. Catalog available. ----------Item 298

OIL FIRED UNIT HEATER. Page 157. A new oil-fired unit heater of 220,000 Btu per hour output with 5,730 cfm air delivery throws heat 75 feet from overhead suspended position. Gun type oil burner is factory pre-wired and assembled. Adjustable louvers. Fan powered for summer air circulation. Also available in smaller sizes from 112,000 to 196,000 Btu per hour. Details available. ----------Item 299

REVOLVING UNIT HEATERS. Page 28. The slowly revolving outlets of this line of unit heaters keep air in constant motion whether it be heated air in winter or cooling air in summer. Literature available. ----------Item 300

REFLECTIVE INSULATION. Page 5. To avoid the discomfort of cold walls, use multiple accordion aluminum in the wall space. Reduction of radiant losses by 97% reflectivity increases sensation of comfort, lowers required air temperature with consequent fuel saving. Summer as well as winter comfort is increased. New product gives edge to edge insulating coverage between beams or studs forming a continuous blanket of uniform depth. Bulletin available. ----------Item 301

AIR CONDITIONING EQUIPMENT. Page 147. A complete line of year round weather conditioning includes convectors, radiators, heaters, air conditioners, furnaces, and self-contained units. Literature available. ----------Item 302

Postage Will be paid by Addressee

No Postage Stamp Necessary If Mailed in the U. S.

BUSINESS REPLY CARD

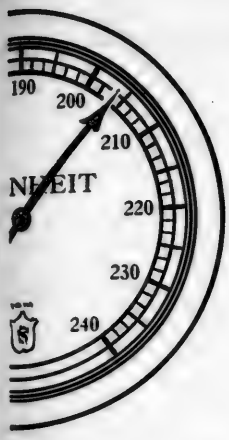
FIRST CLASS PERMIT NO. 53, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

HEATING AND VENTILATING

148 LAFAYETTE STREET

NEW YORK 13, N. Y.

AD-DIGEST SERVICE



if high fuel oil temperatures are what you need—the Paracoil TYPE "GF"*

INDIRECT GAS FIRED FUEL OIL HEATER is the answer!

With sub-water-line oil heaters, a low circulating boiler water temperature can play havoc with even the best engineered No. 6 oil burner layouts—particularly with the viscous oils now being used!

Our Type "GF" Indirect Gas Fired Heater can give you any desired oil temperature you want—without the use of expensive electric boosters!

APPLICABLE TO ALL TYPES OF OIL FIRED APPARATUS!

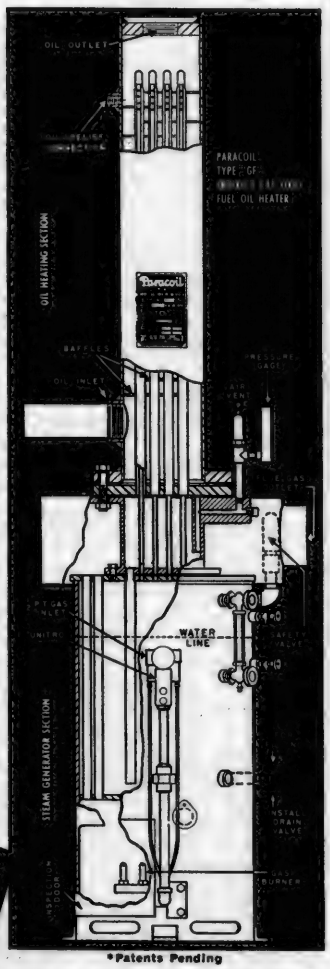
As it is not dependent upon the unit it is servicing for the means of heating the oil, the Type "GF" Heater can be applied to any oil fired apparatus, be it a steam or hot water boiler, a process oven, a dryer or a kiln!

ONE HEATER CAN SERVE MANY BURNERS!

No steam piping required. Heater operates on a closed, internal steam and condensate cycle!

CHECK THESE FEATURES!

Completely factory assembled • Easy to install anywhere, even outdoors • Requires only minimum of floor space • Economical to operate • Wide range of oil heating capacities • Burns any specified type of gas fuel • High oil temperatures at all times • Operation unaffected by normal variation in viscosities of oils being heated.



*Patents Pending

Write today for BULLETIN 60-L

Approved by Board of Standards and Appeals City of New York

DAVIS ENGINEERING

CORPORATION

1064 EAST GRAND ST., ELIZABETH 4, N. J. • 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

new — all metal — completely corrosion-proof

exhaust fans

No thin-skin corrosion resistance here! These newly designed DURCO exhaust fans are *acid-proof metal*—Duriron casing with Durimet 20 multi-blade rotor for permanent acid resistance throughout.

The new lighter DURCO fans are designed to handle acid fumes in schools, laboratories, hospitals and industrial plants efficiently, economically—and *permanently*.

THE DURIRON COMPANY, Inc.
Dept. HV, Dayton, Ohio

Please send Bulletin F/1 on DURCO B-124 Fans.

Name_____

Company_____

Address_____

City_____ State_____

A NEW more reliable air conditioning method

with exact moisture control

FOR YOUR PROCESS OR PROTECTION

FOR TESTING PRODUCTS OR MATERIALS AT ANY TIME OF THE YEAR

Assembling Electronic Parts

Packaging Food Products

Drying Industrial Material

● This Niagara "Controlled Humidity" method gives you the **MOST EFFECTIVE** Air Conditioning because its cooling and heating functions are made completely separate from adding or taking away moisture. This assures you always a precise result. No moisture sensitive instruments are needed.

MOST FLEXIBLE. You can reach and hold any condition in response to instrument settings, or vary it as you wish.

EASIEST TO TAKE CARE OF. The machine is accessible, the control circuits are simple and easy to operate, and there are no solids, salts or solutions to be handled.

MOST COMPACT. It does a very large amount of work in a small space.

INEXPENSIVE TO OPERATE. At normal atmospheric temperatures (unlike systems that use refrigeration to dehumidify) it needs no summer re-heat.

Write for Bulletins 112 and 122

NIAGARA BLOWER COMPANY

Dept. HV, 405 Lexington Ave. New York 17, N. Y.

Niagara District Engineers in Principal Cities of U. S. and Canada

Canadian Degree-Days for April, 1954*

City	April		Cumulative	
	1954	Normal	1954	Normal
Calgary, Alta.	1197	750	9738	8631
Charlottetown, P.E.I.	870	858	7057	7727
Crescent Valley, B. C.	750	624	6976	7328
Edmonton, Alta.	1159	780	9228	9369
Fort William, Ont.	948	888	9225	9478
Grand Prairie, Alta.	1320	822	10403	9617
Halifax, N. S.	751	768	6008	6902
London, Ont.	567	642	6522	6968
Medicine Hat, Alta.	981	606	8124	8194
Moncton N. B.	824	798	7272	8094
Montreal, P. Q.	685	715	7313	8088
North Bay, Ont.	837	813	8479	8746
Ottawa, Ont.	714	726	7630	8364
Penticton, B. C.	606	507	5869	6073
Porquis Junction, Ont.	984	972	10007	10586
Prince George, B. C.	1077	738	8628	8506
Quebec City, P. Q.	834	849	7978	8848
Regina, Sask.	1049	816	9360	10457
St. John, N. B.	816	792	7112	7576
Saskatoon, Sask.	1164	725	9816	10081
Toronto, Ont.	594	669	6005	6895
Vancouver, B. C.	584	498	4914	4977
Victoria, B. C.	597	504	4672	4569
Windsor Ont.	483	582	5717	6454
Winnipeg, Man.	968	822	9456	10444

*These data are supplied through the courtesy of the Meteorological Division, Air Service Branch, Department of Transport, Canada.

The department reports slight revisions in the figures for March, as published in last month's issue. Corrected figures are: Charlottetown, P. E. I., 1153; Edmonton, Alta., 1328; Prince George, B. C., 1249; Victoria B. C., 727.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

AUTOMOTIVE ENGINEERS MEETING—Summer meeting of the Society of Automotive Engineers, at the Ambassador and Ritz-Carlton Hotels, Atlantic City, N. J. Secretary of the Society, 29 W. 39th St., New York 18, N. Y. . . **JUNE 6-11, 1954.**

TESTING MATERIALS MEETING—Annual meeting and exhibition of the American Society for Testing Materials, at the Sherman Hotel, Chicago, Ill. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. . . . . **JUNE 13-18, 1954.**

ENGINEERING EDUCATION MEETING—Annual meeting of the American Society for Engineering Education, at the University of Illinois, Urbana, Ill. Prof. A. W. Bronwell, secretary of the Society, Northwestern University, Evanston, Ill. . . . . **JUNE 14-18, 1954.**

ASME MEETING—Semi-annual meeting of the American Society of Mechanical Engineers, at the William Penn Hotel, Pittsburgh, Pa. Secretary of the Society, 29 W. 39th St., New York 18, N. Y. . . . . **JUNE 20-24, 1954.**

METEOROLOGICAL MEETING—129th National meeting of the American Meteorological Society, in Pullman, Wash. Kenneth C. Spengler, executive secretary of the Society, 3 Joy St., Boston 8, Mass. . . . . **JUNE 23-24, 1954.**

ASHVE MEETING—60th semi-annual meeting of The American Society of Heating and Ventilating Engineers, at the New Ocean House, Swampscott, Mass. A. V. Hutchinson, secretary of the Society, 62 Worth St., New York 13, N. Y. . . . . **JUNE 28-30, 1954.**

REFRIGERATING ENGINEERS MEETING—41st semi-annual meeting of the American Society of Refrigerating Engineers, at the Hotel Olympic, Seattle, Wash. M. C. Turpin, secretary of the Society, 234 Fifth Avenue, New York City. . . . . **JULY 11-14, 1954.**

(*Concluded on page* 156)

get the inside story

on your **AIR FILTERS**

at a glance!

HAYS AIR FILTER GAGES

With an air filter gage you measure the resistance that air meets in passing through a filter—you get the *inside story* at a glance.

A dirt-clogged filter in air circulating or air conditioning systems lowers efficiency and costs you money. Needless changing of filters to avoid clogging is expensive. A small investment in a Hays air filter gage removes this guesswork . . . results in real savings.

Models and mountings available for every air filter use—features include:

- ***easy to read***—**the large dial is visible from a distance.**
- ***minimum maintenance***—**there is no oil to evaporate and no leveling is required.**
- ***constant accuracy*** — **Hays' special "slack diaphragm" retains accuracy.**
- ***easy zero check***—**external zero adjusting screw provided.**

Gages can be furnished with contacts for flash or sound alarms or with damper controls. Portable models also available.

For complete details on Hays Air Filter Gages, write for Bulletin 54-751-12.

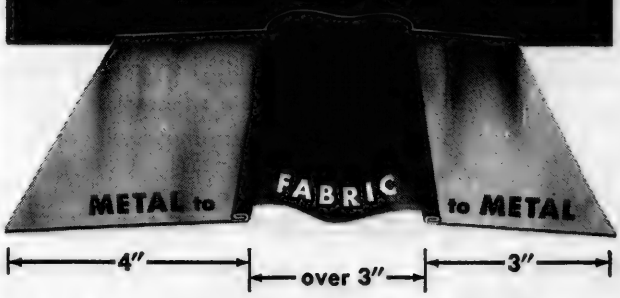
THE **hays** CORPORATION

MICHIGAN CITY 28, INDIANA

Automatic Combustion Control
Boiler Panels • CO_2 Recorders
Veriflow Meters and Veritrol
Gas Analyzers • Draft Gages
Combustion Test Sets
Electronic Oxygen Recorders
Electronic Flowmeters
Electronic Feed Water Controls
Miniature Remote Indicators

NEW! DURO METAL-FAB

makes quality flexible ducts up to 70% faster than old methods

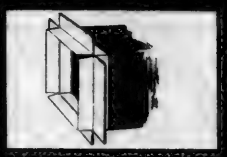


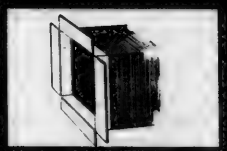
pre-assembled for you metal to fabric to metal!

ONE-PIECE FABRIC AND METAL DUCT CONNECTOR

- **For your protection, exclusive "Double-Loc" metal-to-fabric seam**
- Fastest, simplest money-saving way to fabricate flexible duct connectors
- Wide metal edges ample to form all types of joints (clinch, flange, slip, etc.)
- Finest engineer-approved materials used throughout
- Required flat lengths quickly pulled from Dispens-o-Flat carton. (Packed in 100 ft. rolls)
- Stops vibration noise in furnaces • blowers • air conditioners • attic fans, etc.
- Duro Stapler eliminates costly sewing of fabric
- Available in U.L. approved Canvas, Asbestos, Neoprened Fiberglas

Typical types of connector made with DURO METAL-FAB


CLINCH COLLAR


FLANGE

SLIP

PAT. PEND.

Write for DURO METAL-FAB Samples and Literature.

DURO-DYNE CORPORATION

800E Third Ave., New Hyde Park, L. I., N. Y.

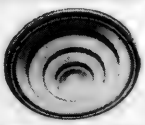
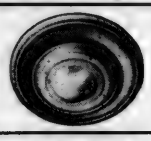
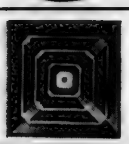
The LEADERS!

AIR DISTRIBUTION
CARNES

in style, quality and economy

Yes, Carnes leads with a line of diffusers that's way ahead! The best ideas and newest developments . . . beautiful styling . . . easy installation . . . complete adjustability are all incorporated to bring you top quality at low prices. Your best bet is Carnes!

A DIFFUSER FOR EVERY REQUIREMENT

MODEL		NECK SIZES	C F M OUTPUT	
E-1	Supply only fixed cone	5 to 32	50 to 13,400	
E EJ ER	Supply only fixed cone Supply only adjustable cone Supply and return fixed cone	5 to 32	50 to 13,400	
BR BRS	Supply only adjustable cones Supply and return adjustable cones	6 to 32	115 to 13,400	
EH	Half Round supply only fixed cone	6 to 20	50 to 2,725	
QSL SFS	Combination diffuser and lighting fixture adjustable Supply only surface type fixed cone	8 to 17	210 to 2,670	
SFR	Supply only recessed type fixed cone	8 x 8 to 20 x 20	150 to 6,925	

CARNES

Write today for Carnes descriptive literature, selection charts and engineering data!

The Most Talked About Name in Air Distribution

W. R. CARNES COMPANY, Verona, Wisconsin

(*Concluded from page* 154)

PLANT MAINTENANCE SHOW—Western Plant Maintenance Show at the Pan Pacific Auditorium, Los Angeles, Calif. Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. . . . . **JULY, 13-15, 1954**

SANITARY ENGINEERS MEETING—48th annual meeting of the American Society of Sanitary Engineering, at the Muehlebach Hotel, Kansas City, Mo. Walter A. Dunn, secretary of the Society, 4716 Ewins Ave. S., Minneapolis, Minn. . . . . **AUGUST 8-12, 1954.**

ASME MEETING—Fall meeting of the American Society of Mechanical Engineers, at the Schroeder Hotel, Milwaukee, Wis. Secretary of the Society, 29 West 39th St., New York, N. Y. . . . . **SEPTEMBER 8-10, 1954.**

CHEMICAL SOCIETY MEETING—126th national fall meeting of the American Chemical Society, in New York City. R. M. Warren, secretary of the Society, 1155 Sixteenth St. N.W., Wash. 6, D. C. . . . . **SEPTEMBER 12-17, 1954.**

INTERNATIONAL INSTRUMENT CONGRESS—First International Instrument Congress and Exposition, sponsored by The Instrument Society of America, to be held in the Commercial Museum and Convention Hall, Philadelphia, Pa. Richard Rimbach, managing director of the Exposition, 845 Ridge Ave., Pittsburgh 12, Pa. . . . . **SEPTEMBER 13-25, 1954.**

PLUMBING AND HEATING CONVENTION—Third annual convention of the American Institute of Wholesale Plumbing & Heating Supply Associations, at New Orleans, La. George T. Underwood, executive secretary, 402 Albee Bldg., Washington, D. C. . . . . **SEPTEMBER 19-22, 1954.**

AGA CONVENTION—Annual convention of the American Gas Association, at Convention Hall, Atlantic City, N. J. Secretary of the Association, 420 Lexington Ave., New York, N. Y. . . . . **OCTOBER 11-13, 1954.**

ELECTRICAL ENGINEERS MEETING—Fall general meeting of the American Institute of Electrical Engineers, at the Hotel Morrison, Chicago, Ill. Secretary of the Institute, 33 West 39th St., New York 18, N. Y. . . . . **OCTOBER 11-15, 1954.**

SAFETY CONGRESS AND EXPOSITION—42nd National Safety Congress and exposition, of the National Safety Council, at Chicago, Ill. R. L. Forney general secretary of the Council, 425 No. Michigan Ave., Chicago 11, Ill. . . . **OCTOBER 18-22, 1954.**

ASA CONFERENCE—Fifth national conference on Standards and 36th annual meeting of the American Standards Association, at the Roosevelt Hotel, New York, N. Y. Secretary of the Association, 70 East 45th St., New York 17, N. Y. . . . . **NOVEMBER 15-17, 1954.**

REFRIGERATION ENGINEERS CONVENTION—17th Annual convention of the Refrigeration Service Engineers Society, at the Raddison Hotel, Minneapolis, Minn. Secretary of the Society, 2577 No. Teutonia Ave., Milwaukee 6, Wis. . . . . **NOVEMBER 18-21, 1954.**

ASME MEETING—Annual meeting of the American Society of Mechanical Engineers, at the Statler Hotel, New York City. Secretary of the Society, 29 W. 39th St., New York City. . . . . **NOVEMBER 28-DECEMBER 3, 1954.**

POWER SHOW—21st National Exposition of Power and Mechanical Engineering, at the Comercial Museum, Philadelphia, Pa., to be held under the auspices of The American Society of Mechanical Engineers. Charles F. Roth, manager of the Exposition, 480 Lexington Ave., New York 17, N. Y. . . . . **DECEMBER 2-7, 1954.**

STORE MODERNIZATION SHOW—1st National Retail Industry Show of the Store Modernization Institute, at Madison Square Garden, New York City. Secretary of the Institute, 20 East 55th St., New York City. . . . . **JANUARY 7-11, 1955.**

HEATING & VENTILATING EXPOSITION—12th International Heating & Ventilating Exposition, at the Commercial Museum and Convention Hall, Philadelphia, Pa., held under the auspices of the American Society of Heating and Ventilating Engineers. Charles F. Roth, manager of the Exposition, 480 Lexington Ave., New York 17, N. Y. . . . . **JANUARY 24-28, 1955.**

LUBRICATION ENGINEERS MEETING—Annual meeting and exhibit of the American Society of Lubrication Engineers, at the Hotel Sherman, Chicago, Ill. Wm. P. Youngclaus, Jr., secretary of the Society, 84 E. Randolph St., Chicago 1, Ill. . . . . **APRIL 13-15, 1955.**

The SUBMERSIBLE SEWAGE EJECTOR

Engineered for

UNDERGROUND LIFT STATIONS

The **weil** NON-CLOG Screenless Submersible Sewage Ejector with the BLADELESS impeller will pump ALL sewage — household sewage, industrial sewage — even rags.

Capacities 35 to 300 GPM with heads to 45 feet.
Discharge: 3" and 4"; ½ H.P. to 3 H.P. Motors.

Illustration shows economical installation which does not require a PUMP HOUSE to mar the landscape. This reduces the overall cost of the Lift Station.

Send for NEW *Bulletin*

NEW Bulletin SE 680 B with plans and specifications for lift station installations as well as other applications will be sent upon request.

weil PUMP COMPANY
1516 NORTH FREMONT STREET • CHICAGO, ILLINOIS

NEW

DWYER FLEX-TUBE Series 25

THE

MANOMETER

THAT

- *COSTS HALF as much*
- *Is only HALF as BIG*
- *IS ACCURATE to 3%*
- *Does 4 NEEDED JOBS*

and is practically indestructible!

Only 7¾" wide, 5¾" high and 1½" deep. Housing and tube of tough Tenite II plastic. Logarithmic indicating tube for accurate and easy reading. Two ranges: 0-3" and 0-7". Gages (1) static pressure, (2) draft, (3) filter resistance and (4) velocity from 0-7000 fpm. (with pitot tube).

A complete "package". Unit includes all necessary connector tubing and fittings, mounting screws, fluid, instructions.

Write for informative catalog page

DWYER *Specialized* INSTRUMENTS and GAGES

F. W. DWYER MFG. CO. • 309 SO. WESTERN AVE. • CHICAGO 12, ILL.

AUTOMATIC D HEATING

NOW—THE WORLD'S FIRST!

Delta's NEW

OIL-FIRED UNIT HEATER*

220,000 BTU/HR OUTPUT • GUN-TYPE OIL BURNER • 5,730 CFM AIR DELIVERY • THROWS HEAT 75 FEET • SUSPENDS OVERHEAD • EXTREMELY ECONOMICAL OPERATION • RUGGED CONSTRUCTION • FACTORY PRE-WIRED & ASSEMBLED • ADJUSTABLE LOUVRES • SUMMER AIR CIRCULATION • EASILY MADE PORTABLE • 59 COMMERCIAL APPLICATIONS • LISTED BY UNDERWRITER'S LABORATORIES

Send for full details

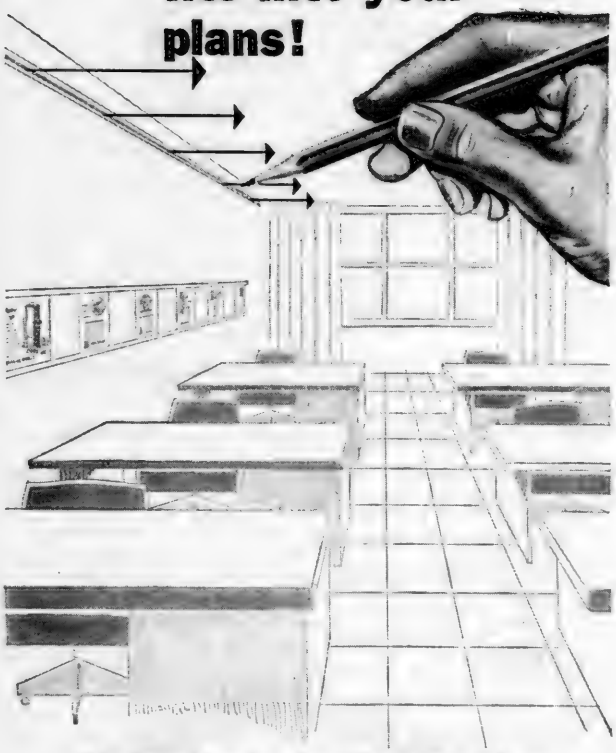
CUT-AWAY VIEW

*Patents Pending

NOW AVAILABLE!
4 SMALLER SIZES FROM 112,000 TO 196,000 BTU/hr

DELTA HEATING CORPORATION, TRENTON 8, NEW JERSEY
In Canada — Kresmo Steam — Montreal and Toronto

See how inconspicuously STRIPLINE fits into your plans!



Unlimited air distribution provided by slender continuous diffusers ...another AGITAIR first!

Stripline diffusers offer complete application versatility. They are ideal for installation in shallow lighting coves...window stools for air curtaining of glass windows or exposed wall areas...side of furred beams... or as a decorative border blanketing the entire area with noiseless, draftless air distribution. Custom built with AGITAIR's patented diffusing vanes, Stripline diffusers create maximum mixing and aspiration... quick temperature equalization and correct air distribution over any desired length.

Write for your free copy of Catalog S-100 today.

AGITAIR STRIPLINE

AIR DEVICES INC.

185 Madison Avenue, New York 16, N. Y.

AIR DIFFUSERS • FILTERS • EXHAUSTERS

DEGREE DAYS FOR APRIL, 1954

(A) Airport readings; (C) city office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING'S 26th Year of Publication of Monthly Degree-Day Data

City	April		
	1954	1953	Normal
Abilene, Texas (A)	30	102	113
Albany, New York (A)	498	544	597
Albuquerque, New Mexico (A)	96	298	289
Alpena, Michigan (C)	714	776	762
Anaconda, Montana (C)	765	805	756*
Asheville, North Carolina (C)	136	318	285
Atlanta, Georgia (A)	65	319	133
Atlantic City, New Jersey (C)	401	396	468
Augusta, Georgia (A)	56	144	62
Baltimore, Maryland (C)	185	327	326
Billings, Montana (A)	661	734	564
Binghamton, New York (C)	442	538	570
Birmingham, Alabama (A)	55	173	128
Bismarck, North Dakota (A)	726	826	657
Block Island, Rhode Island (A)	563	534	603
Boise, Idaho (A)	447	561	453
Boston, Massachusetts (A)	442	475	534
Bozeman, Montana (C)	631	802	731*
Buffalo, New York (A)	524	625	636*
Burlington, Iowa (A)	324	546	425
Burlington, Vermont (A)	644	627	681
Butte, Montana (C)	699	832	741*
Cairo, Illinois (C)	100	298	182
Charleston, South Carolina (C)	29	65	43
Charlotte, North Carolina (A)	112	191	172
Chattanooga, Tennessee (A)	59	237	179
Cheyenne, Wyoming (A)	550	844	717
Chicago, Illinois (C)	379	564	518*
Cincinnati, Ohio (C)	164	366	314
Cleveland, Ohio (A)	327	581	531
Columbia, Missouri (A)	185	435	326
Columbia, South Carolina (C)	51	109	77
Columbus, Ohio (C)	234	495	408
Concord, New Hampshire (A)	579	593	660
Concordia, Kansas (C)	227	486	341
Dallas, Texas (A)	26	124	75
Dayton, Ohio (A)	278	531	435
Deer Lodge, Montana (C)	686	771	735*
Denver, Colorado (A)	333	660	525
Des Moines, Iowa (A)	352	601	438
Detroit, Michigan (A)	442	616	558
Devils Lake, North Dakota (C)	818	871	750
Dodge City, Kansas (A)	226	441	347
Dubuque, Iowa (A)	452	659	543
Duluth, Minnesota (C)	842	867	801
Eastport, Maine (C)	(a)	636	774
Elkins, West Virginia (A)	285	514	477
El Paso, Texas (A)	17	69	110
Ely, Nevada (A)	560	749	639
Erie, Pennsylvania (C)	(a)	591	609
Escanaba, Michigan (C)	748	793	828
Evansville, Indiana (A)	165	376	251
Fargo, North Dakota (A)	711	819	687
Fort Smith, Arkansas (A)	54	255	127
Fort Wayne, Indiana (A)	346	581	516
Fort Worth, Texas (A)	28	127	27
Fresno, California (A)	98	185	135
Galveston, Texas (C)	10	27	30
Grand Junction, Colorado (A)	248	466	402
Grand Rapids, Michigan (A)	471	658	606
Green Bay, Wisconsin (A)	592	707	696
Greensboro, North Carolina (A)	150	252	241
Greenville, South Carolina (A)	89	174	161
Harrisburg, Pennsylvania (A)	295	417	423
Hartford, Connecticut (A)	446	467	528
Hatteras, North Carolina (C)	97	135	171
Havre, Montana (C)	825	783	597
Helena, Montana (A)	746	748	654
Houston, Texas (C)	10	30	27
Huron, South Dakota (A)	546	728	558
Indianapolis, Indiana (A)	261	516	432
Jackson, Mississippi (A)	33	112	81
Kansas City, Missouri (A)	172	431	292
Knoxville, Tennessee (A)	80	274	196
La Crosse, Wisconsin (A)	463	679	552
Lander, Wyoming (A)	539	783	687
Lansing, Michigan (A)	489	663	591
Lewiston, Maine (O)	670	522	693*
Lincoln, Nebraska (C)	304	533	377
Little Rock, Arkansas (A)	51	213	122

City	April		
	1954	1953	Normal
Livingston, Montana (C)	673	797	653*
Los Angeles, California (C)	120	180	129
Louisville, Kentucky (A)	163	366	285
Lynchburg, Virginia (A)	182	288	289
Macon, Georgia (A)	36	113	62
Madison, Wisconsin (C)	466	664	573
Marquette, Michigan (C)	754	859	789
Memphis, Tennessee (A)	68	215	139
Meridian, Mississippi (A)	37	126	85
Milwaukee, Wisconsin (A)	516	672	621
Minneapolis, Minnesota (A)	553	715	570
Moline, Illinois (A)	355	570	453
Montgomery, Alabama (A)	29	120	80
Nantucket, Massachusetts (A)	599	572	642
Nashville, Tennessee (A)	91	282	186
New Haven, Connecticut (A)	484	488	567
New Orleans, Louisiana (C)	8	28	19
New York, New York (C)	360	417	456
Newark, New Jersey (A)	358	405	450
Norfolk, Virginia (A)	175	179	265
North Head, Washington (C)	(a)	514	492
North Platte, Nebraska (A)	414	651	489
Oak Ridge, Tennesee (C)	105	293	(a)
Oakland, California (A)	193	314	282
Oklahoma City, Oklahoma (C)	79	284	169
Omaha, Nebraska (A)	309	551	389
Parkersburg, West Virginia (C)	193	411	347
Peoria, Illinois (A)	304	533	435
Philadelphia, Pennsylvania (C)	288	345	369
Phoenix, Arizona (A)	7	39	62
Pittsburgh, Pennsylvania (C)	238	436	402
Pittsfield, Massachusetts (A)	570	635	690
Pocatello, Idaho (A)	508	649	561
Portland, Maine (A)	654	620	693
Portland, Oregon (C)	405	394	347
Providence, Rhode Island (A)	459	456	570
Pueblo, Colorado (A)	246	489	456
Raleigh, North Carolina (C)	110	178	172
Rapid City, South Dakota (A)	565	792	615
Reading, Pennsylvania (C)	281	393	411
Red Bluff, California (A)	129	225	177
Reno, Nevada (A)	432	579	519
Richmond, Va. (A)	183	222	271
Rochester, New York (A)	534	603	615
Roswell, New Mexico (A)	63	171	185
Sacramento, California (C)	126	203	196
St. Joseph, Missouri (A)	222	493	297
St. Louis, Missouri (C)	155	385	270
Salt Lake City, Utah (A)	835	551	453
San Antonio, Texas (A)	8	36	34
San Diego, California (A)	116	172	151
Sandusky, Ohio (C)	337	573	513
San Francisco, California (C)	232	364	279
Sault Ste. Marie, Michigan (A)	841	841	846
Savannah, Georgia (A)	29	87	43
Scranton, Pennsylvania (C)	391	517	516
Seattle, Washington (C)	482	434	396
Sheridan, Wyoming (A)	640	779	645
Shreveport, Louisiana (A)	27	89	61
Sioux City, Iowa (A)	416	634	474
Spokane, Washington (A)	640	574	561
Springfield, Illinois (C)	220	442	350
Springfield, Missouri (A)	125	443	295
Syracuse, New York (A)	503	573	570
Tacoma, Washington (C)	(a)	(a)	435
Terre Haute, Indiana (A)	238	471	371
Toledo, Ohio (A)	393	608	555
Topeka, Kansas (C)	171	443	295
Trenton, New Jersey (C)	322	394	429
Utica, New York (O)	542	630	588*
Valentine, Nebraska (C)	497	763	543
Walla Walla, Washington (C)	387	386	338
Washington, D. C. (C)	191	276	314
Wichita, Kansas (A)	139	403	280
Williston, North Dakota (C)	803	861	663
Winnemucca, Nevada (A)	462	644	546
Yakima, Washington (A)	518	500	408

(a) Data not available.

*Same normal figures as previously listed by HEATING AND VENTILATING since new figures are not available. All other normal figures in this table are based on a 30-year period covering 1921 to 1950, inclusive, recently compiled and published by the U. S. Weather Bureau.

Figures in this table, with seven exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y.; and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.

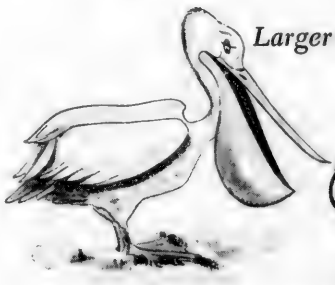
For highest filtering efficiency wise birds select AGITAIR FM AIR FILTERS

High velocity...utmost efficiency

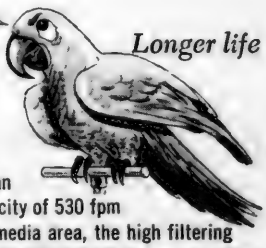
One-third less space required

Lowest installation and maintenance costs

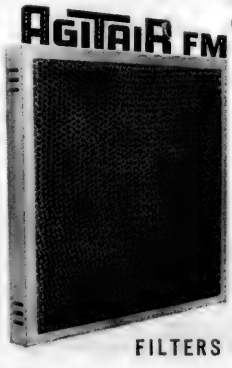
Larger capacity



Longer life



Designed for an approach velocity of 530 fpm over the net media area, the high filtering efficiency of the AGITAIR FM increases as the dust load is applied. You save ⅓ in space required, in number of units to be installed and serviced. Very large dust-holding capacity of AGITAIR FM assures longer service periods, fewer cleanings per year, lower service charges. No exposed wire ends to cut or damage hands of service operators. Compare.



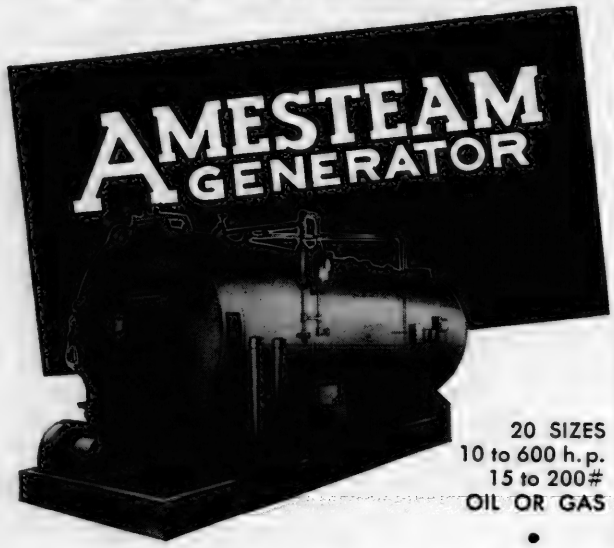
Send today for free Cost Comparison Chart.

AIR DEVICES INC.
185 Madison Avenue, New York 16, N. Y.

FILTERS • AIR DIFFUSERS • EXHAUSTERS

REAL SAVINGS

in installation . . . in operation with these "PACKAGED" BOILERS



20 SIZES
10 to 600 h. p.
15 to 200#
OIL OR GAS

JUST SET IT ON YOUR CONCRETE FLOOR — no special foundation or heavy stack are needed. You make BIG savings on installation of AMESTEAM GENERATOR because it's a complete, self-contained unit, ready to start generating steam!

FULLY AUTOMATIC . . . TROUBLE-FREE! Set it and forget it. No more continual dirt, dust and ashes. Models for oil or for gas, or combination units for either fuel.

EASY TO CLEAN! EASY TO GET AT! Davit-hinged doors at rear give quick access to furnace and all tubes — and look at the space under the shell!

COMPLETE SERVICE! Our LOCAL service man starts your unit and gives you three months' FREE service.

Write for FREE bulletin TODAY!

AMES IRON WORKS
Box C-64 Oswego, N. Y.
Gentlemen:
Please send me further information on AMESTEAM GENERATORS and name of nearest representative.

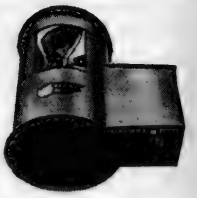
NAME.....
COMPANY. ... .
ADDRESS.....

AMES IRON WORKS INC.

STAXAUSTER can be used to convert all types of roof ventilators into powerful exhaust or air supply units.

Allen EXHAUST FANS

Whether you are working on new construction or motorizing existing ventilators, Allen Exhaust Fans will be the top-performance, quality answer to the particular ventilating problem. Easy to install, economical to operate, these fans meet a wide range of needs. In addition to the Fan Section shown above, the line includes the Remote Drive Allen Staxauster, and for wall installations, the Allen Exhaust Fan and the Lo-Noiz-Level Multiblade Fan. Our representatives are in most principal cities; names listed in our catalog in Sweet's Architectural File, Section 20b.



Remote Drive Allen Staxauster
Specially designed for applications handling corrosives and/or high-temperature air.

Write for catalog.

ALLEN ENGINEERED VENTILATION
PRODUCTION PLANNING CO.
ROCHESTER, MICHIGAN
Roof Ventilators for Every Commercial and Industrial Need

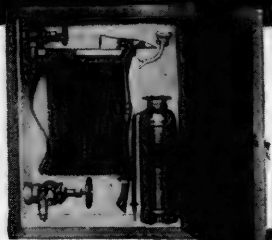
Best for Clients

PROVED RELIABLE, ECONOMICAL

ALLENCO

INTERIOR FIRE-PROTECTION EQUIPMENT

Complete Line — 480 Cabinets Alone
Modern, Most Widely Used



Easiest for you

Reliable Delivery—
Goes in Easier

SINCE 1887
W. D. ALLEN
Manufacturing Co.
CHICAGO 6 · NEW YORK 7

4 steps

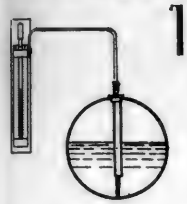
to Better Measurement of Tank Contents

The PETROMETER

Tank Gauge offers you the convenience of Remote Reading plus these four extra features:

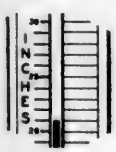
SIMPLE, TROUBLE-FREE DESIGN • • • No complicated and troublesome pulleys, springs, or other mechanical or electrical gadgets—the Petrometer gauge operates on the principle of static pressure—a principle that is as unfailing as the law of gravity. Its operation is similar to that of the familiar U-tube. Simple, rugged and dependable.

1



CONSTANT ACCURACY • • • The large vertical scale on the Petrometer gives you constant, accurate readings. The red liquid column is clearly visible—moves up and down as contents vary, just like the liquid level in your tank.

2

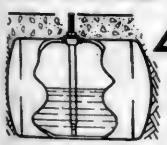


INTERCHANGEABLE SCALES • • • The scale on the Petrometer is readily removed or adjusted to correct for tank pitch or when changing liquids. No tools are needed.

3

EASY INSTALLATION • • • Gauges can be installed on tanks above or below the ground and up to ¼ mile away. The tank assembly for the gauge can be installed even when the tank contains liquid. It can also be fitted in the tank separately to complete the tank work and the gauge connected any time later. Just tighten one simple connection and installation is complete.

4



Send for Bulletin PH today.

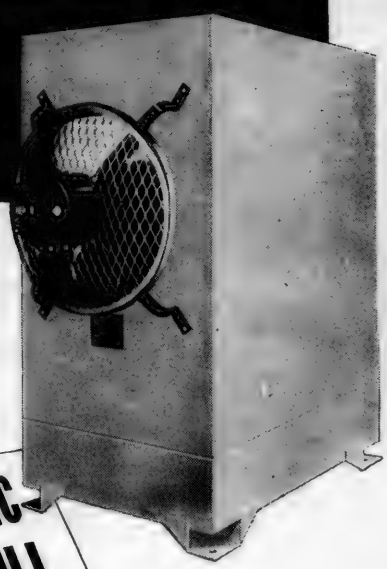
7

LIQUIDEPTH INDICATORS, INC.

43-22 TENTH ST., LONG ISLAND CITY 1, N. Y.

COOLING TOWER

by KRAMER



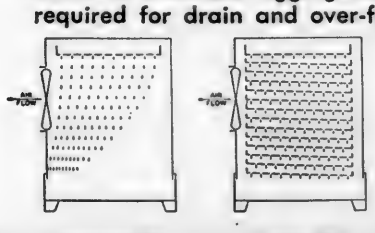
3 to 8 Ton

SCIENTIFIC NEW FILL

MORE CAPACITY
The redistributing decks keep the water uniformly suspended, providing maximum contact between air and water.

LONG LIFE
Casing and sump are heavy gauge steel, hot dipped galvanized after fabrication. Redistributing decks are metal and fireproof.

EASY INSTALLATION
Unit is shipped assembled but can be knocked down to eliminate rigging costs. One fitting required for drain and over-flow.

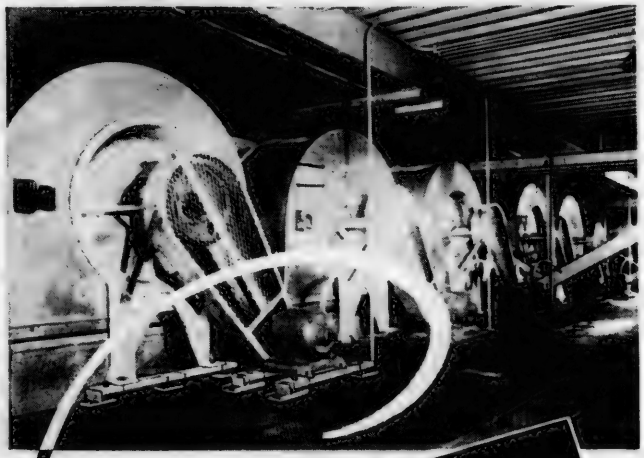


Conventional Fill Kramer Fill

Write for Catalog R-225

KRAMER TRENTON CO.
Trenton 5, N. J.

STOP VIBRATION



with KORFUND VIBRATION CONTROL

The photograph shows five of a total installation of 324 Clarage Heavy Duty Fans at The Upjohn Company's new pharmaceutical plant at Kalamazoo, Mich.

Korfund Twin Rail Bases under each fan and motor keep noise and vibration from reaching working areas through the steel deck or through the air conditioning ducts, and make possible this simple, space-saving installation on suspended platforms and structural steel members under the roof.

Korfund Duplex Twin Rail Bases have separate rails for fan and motor, and are completely adjustable—on the job—to take care of any drive center distance, motor position, bolt location or other variables. Built-in chocks assure positive alignment. Light weight, they are easier to handle. Base Drawings are immediately available for most fans and motors. And, because of standardization, long production runs reduce cost and permit quick deliveries.

For installation of fans, pumps, compressors, refrigerating and other types of mechanical equipment for both normal and critical operating conditions, basic isolation recommendations are given in Bulletin No. 15. Write for your free copy today, or see our catalog in Sweet's Files. Write, too, for one of our free Belt-Center Distance Calculators—it's a real time saver.

If you have a specific problem, we will be glad to submit recommendations without obligation. A half century of experience is at your disposal. Representatives in principal cities.

KORFUND VIBRATION CONTROL — SPRINGS — RUBBER — CORK

THE KORFUND CO., INC.

48-01 E. Thirty Second Place, Long Island City 1, N. Y.
In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

HEAT when and where you need it — at the flip of a switch.

SAVE on low initial cost, simple installation and efficient operation.

ENJOY fully automatic controls and years of dependable performance.

OLSON

DIRECT FIRED HEATERS

Gas, Oil, Coal or Dual Gas and Oil

Arthur A. Olson & Company
Canfield, Ohio

Write for bulletin and engineering data sheet

Air Cooling COILS

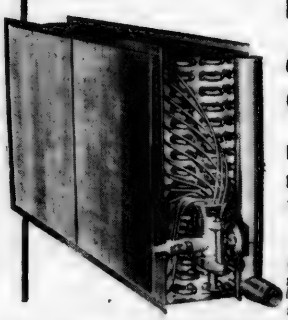
2 to 15 Ton CAPACITY

NEW Complete Line

REMPE

COMPLETE WITH MULTI-OUTLET EXPANSION VALVES

MADE-ON— READY TO INSTALL



4 Row Coils for Residential Jobs.

6 Row Coils for Commercial Jobs.

Precision built to insure top performance and to give trouble-free service.

Write for bulletin and prices.

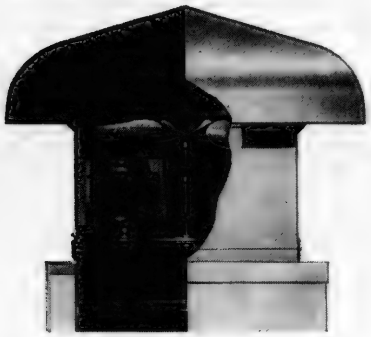
Complete facilities for fabrication of pipe coils—all types—all materials. Engineering service. Send details for price.

HEAT TRANSFER EQUIPMENT — REMPE CO. — Founded 1890

REMPE COMPANY

358 N. Sacramento Blvd., Chicago 12, Ill.

VENTILATING PROBLEM?



Let Burt Engineers Solve It!

Burt engineers are specialists in air movement. They should be—with over half a century of practical experience in designing, engineering and manufacturing ventilators for the alphabet—from atomic bomb plants to zoos . . . After the slide rule, Burt has the invaluable asset of thousands of successful ventilator case histories to check and prove or disprove the paper work.

BURT'S LINE IS COMPLETE

Burt manufactures all types, all sizes of ventilators. Burt is not interested in selling a specific type because Burt makes them all. That's why Burt's unbiased recommendation is real assurance of satisfaction. Write for our general catalog.

FAN & GRAVITY VENTILATORS • LOUVERS • SHEET METAL SPECIALTIES

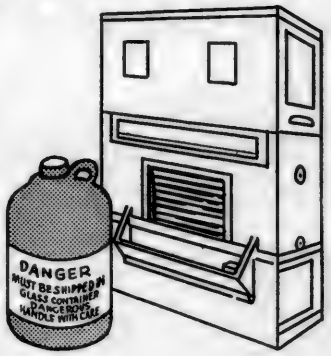
The Burt Manufacturing Company

49 E. South Street, Akron 11, Ohio

Member Power Fan Manufacturers Association

WHY *DESTROY*

Expensive Equipment by using Destructive Substances?



Chemicals that EAT their way out of Metal, Wood or Plastic Containers are injurious to the very surfaces that they are intended to treat. If a glass container should be accidently broken, the contents could do untold damage to valuable property!

SOLVEX

(In tablet or granular form)

LOWERS HIGH HEAD PRESSURE QUICKLY

(And May Be Used While Plant is In Operation)

REMOVES RUST, SCALE, ALGAE

And Other Encrusting Matter from Condenser Tubes and Compression Jackets in 1 to 5 Hours.

AND SOLVEX KEEPS THEM CLEAN!

BE SAFE! USE SOLVEX!

Manufactured By

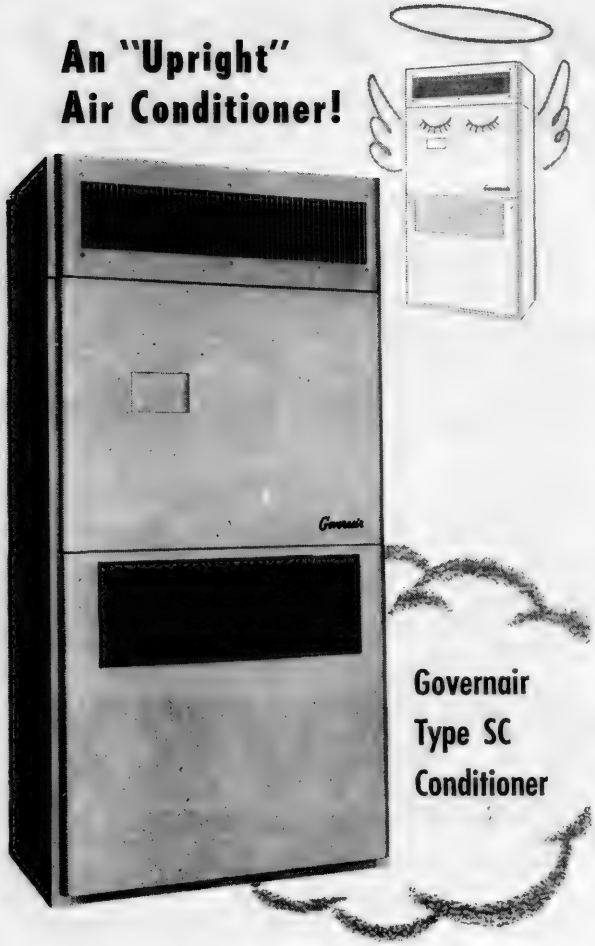
CHEMICAL SOLVENT CO.

3005 16th Street North Birmingham, Ala.

VIRGINIA SMELTING CO.

WEST NORFOLK, VA.

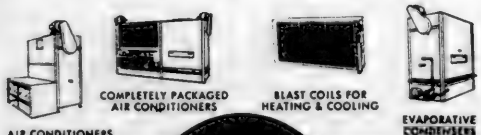
An "Upright" Air Conditioner!



Yes, this is an *upright* Governair self-contained conditioner—but that's not the reason for the halo.

The halo is there because this air conditioner behaves itself! Built to perform true air conditioning quietly and efficiently . . . it does just that! Flexibility, compact design, easy installation, dependability and economy are among its many virtues.

Available in capacities from 3 to 15 tons, the Governair Type SC Conditioner is the answer to your air conditioning needs in commerce, institutions, factories and homes. Choose *Governair* . . . originators* of completely packaged air conditioners!



GOVERNAIR

*Type SCU Conditioners Patent No. 2,297,928

GOVERNAIR CORPORATION • 513 N. Blackwelder • Oklahoma City, Okla.

PALMER

mercury actuated Dial Thermometers now in three types to suit any requirements

1

Rigid Stem Dial Thermometer

Rigid stem tapered bulb, interchangeable with standard industrial thermometer separable socket.

2

Wall Mounted Dial Thermometer

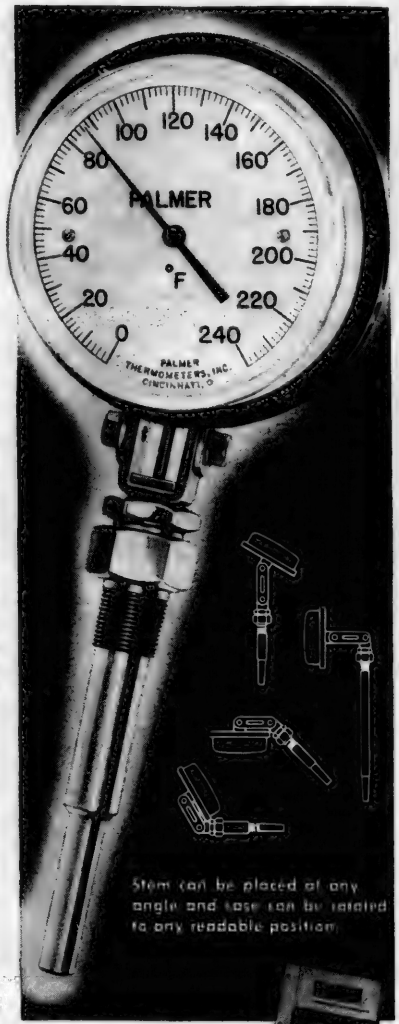
Wall mounted dial thermometer with flexible connecting armor. Case adjustable to easy reading position.

3

Flush Mounted Dial Thermometer

Flush mounted style for panel mounting with flexible connecting armor.

All three types have a full 4½" dial Face


PALMER
°F
PALMER THERMOMETERS, INC. CINCINNATI, O.
Stem can be placed at any angle and case can be rotated to any readable position

WRITE FOR CATALOG INFORMATION

for accuracy: Mercury actuated . . . Fully Compensated by Invar Compensation. Guaranteed Accurate 1 scale division.

for angularity: Can be adjusted to most readable position at any angle desired.

for readability: Bold Black Numbers . . . 11" of scale Reading Dial face can always be placed in easiest readable position.

for interchangeability: Always specify "PALMER" Separable sockets as they are interchangeable for Dial or Industrial type Thermometers.

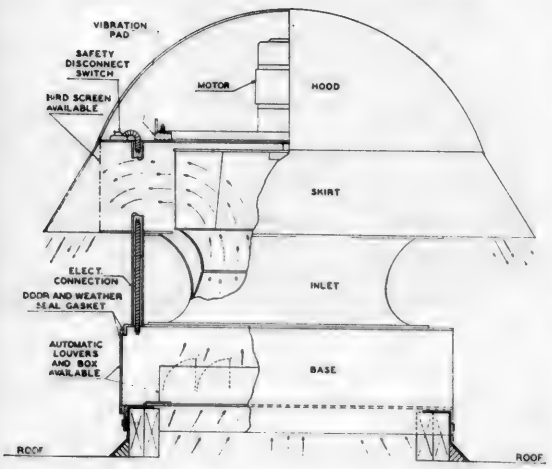
PALMER THERMOMETERS, INC.
Mfrs. of Industrial Laboratory Recording and Dial Thermometers
NORWOOD AVE., CINCINNATI 12, O.

NEW! POWER ROOF VENTILATOR

NON OVERLOADING
CENTRIFUGAL TYPE

This Assembly Aerodynamically Designed. Centrifugal Type, Low Smooth Silhouette.

★ QUIET OPERATION ★ BELT or DIRECT DRIVE
★ AVAILABLE IN STEEL - ALUMINUM - COPPER GALVANIZED ★ LOWER POWER CONSUMPTION



★ **"CERTIFIED RATINGS BASED ON N.A.F.M. TESTING PROCEDURE."**

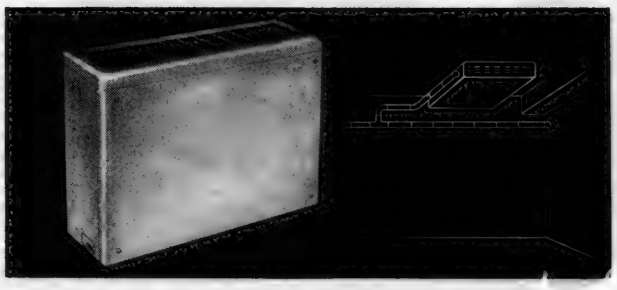
WRITE FOR BULLETIN CRV-101
8622 FERRIS ST., MORTON GROVE, ILL.

LUNGS FOR INDUSTRY
GENERAL BLOWER CO.
PLANT & GENERAL OFFICES • MORTON GROVE, ILL.
SALES OFFICES IN PRINCIPAL CITIES

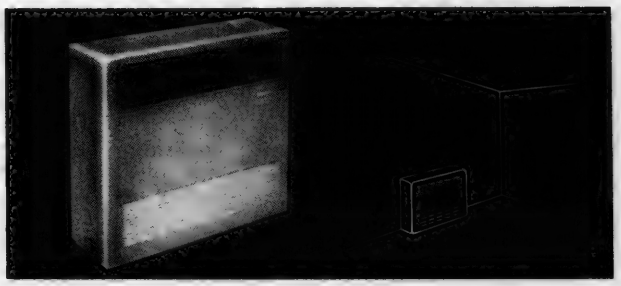
It's Triplets!

—in Carrier Cabinet Unit Heaters

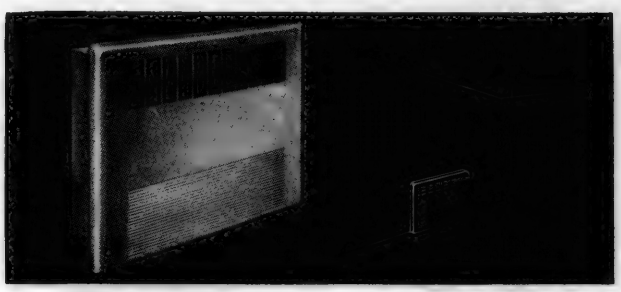
FOR COMMERCIAL, INDUSTRIAL AND INSTITUTIONAL HARD-TO-HEAT SPACES



Steam or hot water. 3 models in 3 sizes



32,000 to 115,000 Btu per hour (basic rating)



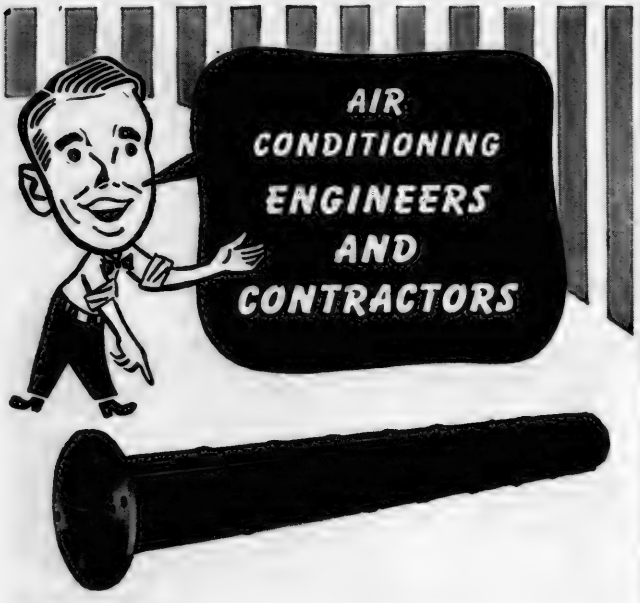
Carrier announces the arrival of an addition to its line of Unit Heaters for commercial buildings, auditoriums, recreation halls, public schools and similar buildings having lobby, vestibule or special space heating problems. Here are big-capacity Cabinet Unit Heaters offering gently fan-propelled heat output. Construction, operating and control features are many. Efficient performance and long life are Carrier-assured.

Carrier Cabinet Unit Heaters are designed for ceiling-mounted, wall-hung, inverted wall-hung, wall-recessed or floor installation. For full information WRITE to Carrier Corporation, Syracuse, New York.

JOBBERS AND INSTALLERS—Ask us also about a Carrier extra-profit protected franchise.

Carrier

AIR CONDITIONING
REFRIGERATION
INDUSTRIAL HEATING



Taco

"CONTROLLED VELOCITY" CHILLERS

1. Improved heat transfer
2. No oil logging or slop over
3. Rapid response to Thermal Expansion Valve

HERE ARE THE FACTS . . .

- All incoming liquid is carried to the top of the Chiller in the first pass.
- All refrigerant and oil are in constant movement forward.
- No liquid (refrigerant or oil) can accumulate in any part of the Chiller.
- At each head pass, liquid refrigerant and oil are agitated by a constant stream of expanding gas.
- Flow of refrigerant and oil is unretarded . . . free of "traps" and short radii.

For full details and application data, send for Bulletin CWF and schematic on "Controlled Velocity".

Taco

Circulating Pumps

TACO HEATERS, INCORPORATED
1160 Cranston St.
Cranston 9, R. I.

Tank Heating Units

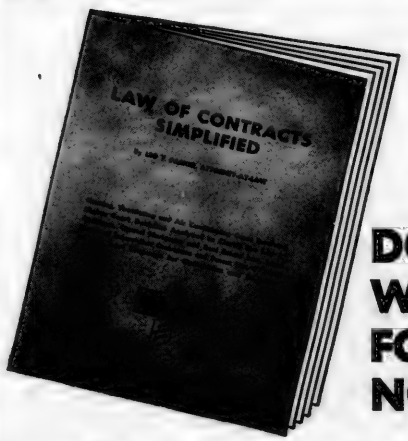
Condensate Coolers
Converters
Fuel Oil Heaters
Oil Coolers
Radiation Heaters
Water Heaters

Chillers

ANY AIR...ANYWHERE...foul or moist, stale or dry, smoky or gaseous..it's up and out quickly with a Muckle Vent. Proven performance of Muckle Vents guarantees superior efficiency on any building, under any conditions. Architects and builders who compare specify reliable Muckle Vents. For greater working efficiency or controlled customer comfort..you can depend on Muckle Vents. Streamlined, propeller driven, roof mounted..motor out of air stream..15 sizes - 254 CFM to 10280 CFM. Write today for FREE Application information

Muckle

MOISTURE IS NO PROBLEM
Remove moisture filled air with maximum efficiency.
MANUFACTURING COMPANY
OWATONNA 3 MINN.



DON'T WORK FOR NOTHING!

You may find yourself working for nothing . . . if you work under a poorly drawn contract. You may lose money . . . if you accept work without understanding the terms under which it is to be done.

Written in simple, everyday language, "Contracts Simplified" shows you the pitfalls which are often the cause of costly lawsuits. Using actual court decisions, it illustrates many of the elementary principles of law which everyone should know before drawing—or accepting—a contract. For example, do you know the law covering "fine print?" Do you know the legal aspects of a "cost plus" contract? Do you know when a contract can be rescinded? These are a few of the scores of points which are covered briefly and clearly in "Contracts Simplified." Order a copy today. You'll find it worth many times its cost in the time and trouble it saves you.

26 pages $1.00 postpaid **8½" x 11" page size.**

THE INDUSTRIAL PRESS
148 LAFAYETTE STREET **NEW YORK 13, N. Y.**
H&V-6-54

A-J Mfg. Co. 41
Acme Industries, Inc. 28
Aerofin Corp. ..... *
Aerovent Fan Co., Inc. ..... *
Air Devices, Inc. 158-159
Air Filter Corp. ..... *
Air-Maze Corp. ..... *
Airtemp Div. of Chrysler Corp. ... 50
Airtherm Manufacturing Co. ..... *
Alco Valve Co. ..... *
Allen-Bradley Co. 20
Allen, W. D., Manufacturing Co. .. 160
Allis-Chalmers Mfg. Co. ... Insert 38-39
American Air Filter Co., Inc. 40
American Blower Corp. 14
American Brass Co. 9
American District Steam Co., Inc. . 47
American Gilsonite Co. 27
American Machine & Metals, Inc. . 1
American Radiator & Standard Sanitary Corp. 68
Ames Iron Works 160
Anemostat Corp. of America ..... *
Armstrong Machine Works Inside Front Cover
Babcock & Wilcox Co. ..... *
Babcock & Wilcox Co. Tubular Products Div. 35
Barber-Colman Co. 22-23
Barkow, Aug., Mfg. Co., Inc. 46
Bell & Gossett Co. 61
Bethlehem Steel Co. ..... *
Binks Manufacturing Co. 131
Bishop & Babcock Mfg. Co. 49
Bituminous Coal Institute 133
Boiler Engineering & Supply Co., Inc. Continental Boiler Div. ... *
Brunner Manufacturing Co. 7
Bryant Heater Div., Affiliated Gas Equipment, Inc. 17
Buffalo Forge Co. 31
Bundy Tubing Co. ..... *
Burnham Corp. ..... *
Burt Manufacturing Co. 163
Bush Manufacturing Co. 67
Byers, A. M., Co. ..... *
Carnes, W. R., Co. 156
Carrier Corp. 165
Chase Brass & Copper Co. 44
Chelsea Fan & Blower Co., Inc. ... 148
Chemical Solvent Co. 163
Chicago Pump Co. ..... *
Clarage Fan Co. ... Inside Back Cover
Classified Advertisements 167
Cleaver-Brooks Co., Boiler Div. ... 55
Cleveland Fuel Equipment Co. ... *
Combustion Engineering, Inc. 48
Committee on Steel Pipe Research *
Connor Engineering Corp. 65
Copeland Refrigeration Corp. .... *
Coyne & Delaney Co. ..... *
Crane Co. 70
Curtis Refrigerating Machine Div., Curtis Manufacturing Co. 36
Davis Engineering Corp. 153
Debothezat Fans Div., American Machine & Metals Inc. 1
Decatur Pump Co. ..... *
Delta Heating Corp. 157
Detroit Controls Corp. 139
Doerr Electric Corp. ..... *
Dollinger Corp. ..... *
Dunham, C. A., Co. 129
Duriron Company, Inc. 153
Duro-Dyne Corp. 155
Dwyer, F. W., Mfg. Co. 157
Elgo Shutter & Mfg. Co. ..... *
Emerson Electric Mfg. Co. ..... *
Farr Co. 16
Field Control Div., H. D. Conkey & Co. 152
Fitzgibbons Boiler Co., Inc. 136
Flexaust Co. ..... *
Flexonics Corp. ..... *
Frick Company 42
General Blower Co. 165
General Electric Co. ..... Insert 57-58
General Fittings Co. ..... *
Glass Fibers, Inc. 66
Governair Corp. 164
Grinnell Co., Inc. ..... *
Halstead & Mitchell 141
Hays Corp. 155
Heat-Timer Corp. ..... *
Henry Valve Co. ..... *
Hoffman Specialty Mfg. Co. 59
Illinois Engineering Co., Div. American Air Filter Co., Inc. 52
Illinois Testing Laboratories, Inc. .. *
Industrial Press 60
Infra Insulation, Inc. 5
Iron Fireman Mfg. Co. ..... *
Jenkins Bros. ..... *
Johnson Service Co. ..... Back Cover
Joy Manufacturing Co. 25
Kaiser, E. B. Co. ..... *
Kennard Corp. 71
Korfund Co., Inc. 162
Kramer Trenton Co. 161
Ladish Co. ..... Insert 18-19
Lawler Automatic Controls, Inc. .... *
Libbey-Owens-Ford Glass Co. ..... *
Liquidepth Indicators, Inc. 161
Magnetrol, Inc. ..... *
Marley Company ..... *
Marlo Coil Co. 54
Marsh Heating Equipment Co. ... 62
McCord Corp. 146
McDonnell & Miller, Inc. 15
McQuay, Inc. 63
Minneapolis-Honeywell Regulator Co. 126-127
Modine Manufacturing Co. ..... *
Muckle Manufacturing Co. 166
Nash Engineering Co. 72
National Heater Co., Inc. ..... *
National Tube Div., United States Steel Corp. 37
Naylor Pipe Co. ..... *
Nelson, Herman Div., American Air Filter Co., Inc. ..... *
Niagara Blower Co. 154
Nicholson, W. H., & Co. ..... *
North American Mfg. Co. ..... *
Olson, Arthur A., & Co. 162
Orr & Sembower, Inc. 145
Palmer Thermometers, Inc. 164
Patterson-Kelley Co., Inc. 137
Petro 24
Powder Power Tool Corp. ..... *
Powers Regulator Co. 10-11-143
Production Planning Co. 160
Pyle-National Co. 56
Ramset Fasteners, Inc. 150
Reading Tube Corp. 29
Redmond Co., Inc. ..... *
Rempe Company 162
Revere Copper & Brass, Inc. 123
Rigidbilt, Inc. ..... *
Sarco Co., Inc. 43
Sarcotherm Controls, Inc. 34
Siemon Manufacturing Co. ..... *
Selec Temp Div., Iron Fireman Mfg. Co. 53
Skidmore Corporation 51
Smith, H. B., Co., Inc. 149
Spence Engineering Co., Inc. ..... *
Sturtevant Div., Westinghouse Electric Corp. 151
Superior Combustion Industries, Inc. 69
Taco Heaters, Inc. 166
Taylor Forge & Pipe Works ..... *
Thrush, H. A., & Co. 30
Titusville Iron Works 21
Trane Co. 12-13-32-33
Tube-Turns ..... Insert between 40-41
Tuttle & Bailey, Inc. ..... *
U. S. Electrical Motors, Inc. ..... *
Union Asbestos & Rubber Co. 147
United States Steel Corp. 37
Wagner Electric Corp. ..... *
Want Advertisements 167
Watts Regulator Co. 168
Webster, Warren & Co. 2
Weil Pump Co. 157
Western Engineering & Mfg. Co. .. *
Westinghouse Electric Corp. 151
Wing, L. J., Mfg. Co. 26
Worthington Corp. 64
Yarnall-Waring Co. ..... *
York Corp. ..... *
Young Radiator Co. 45
Youngstown Sheet & Tube Co. ... 135
Zonolite Co. ..... *
Zurn, J. A, Mfg. Co. ..... *

*Advertisement appeared in preceding issue.

CLASSIFIED ADVERTISING

Non-display advertisements 15 cents a word per insertion. (No charge for name and address.) Minimum charge $3.00. Payable in advance

MECHANICAL ENGINEER

for general building contractor. Excellent opportunity and permanent position with young, expanding company. Must be capable of estimating and analyzing subbids received from mechanical and electrical subcontractors and supervise and expedite work after subcontract awarded. Write full particulars, including education, experience, personal details, and salary requirements to:
BLOUNT BROTHERS CONSTRUCTION CO.
Post Office Box 1144, Montgomery, Alabama

FOR SALE

60 HP General Electric Motor 1740 RPM 220 Volt 60 Cycle 3 Phase Type KT-533. Newly rewound and completely rebuilt. Price $350.00. Write NASH-KELVINATOR, Detroit 32, Michigan. Attention—Mr. W. R. Stowe.

FOR SALE

ONE #52-S-1 TYPE HRT PACIFIC TUBULAR STEEL BOILER, 90 H.P., STOKER FIRED, S.B.I. Net 12,150 Sq. Ft. steam. Used only four years. In very good condition. $500.00 F.O.B. Cincinnati, Ohio. MUTUAL MFG. & SUPPLY CO., 3300 Spring Grove Ave., Cincinnati 25, Ohio.

Is there any equipment you need, or would like to sell? Or a position you have open, or want to secure? The Advertisements in HEATING AND VENTILATING'S Classified Advertising Section bring results!

SALES OPPORTUNITY

United States rights to All-Vac Differential Steam Control, world's most efficient. Suitable line for organization handling steam specialties, or live ambitious party seeking life assignment. Box No. 822, HEATING AND VENTILATING, 148 Lafayette St., New York 13, N. Y.

CONNECTION DESIRED WITH FACTORY interested in manufacturing of centrifugal fans with high efficiency. Write to—Box No. 823, HEATING AND VENTILATING, 148 Lafayette St., New York 13, N. Y.

WANTED — ESTIMATOR

With Midwestern Plumbing and Heating Concern. State age and experience. Box No. 824, HEATING AND VENTILATING, 148 Lafayette St., New York 13, N. Y.

Automatic T.&P. Relief Valves

FOR ANY SIZE INSTALLATION

No. N40XL Shown

WATTS Complete Line

Emergency temperature relief protection is necessary for every domestic hot water supply storage system because excessively heated water is dangerous in any quantity. Small water heaters for homes, medium storage tanks for commercial application, large storage tanks for institutional or industrial installation - - every one has specific temperature and pressure relief requirements. Obviously, no one relief valve can meet every need.

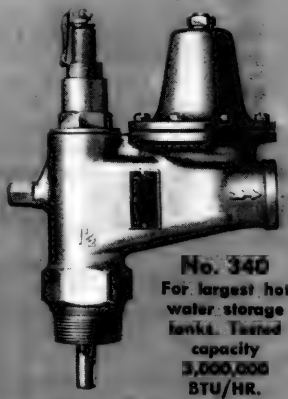
Reliable Watts automatic T & P relief valves are available in graded sizes and discharge capacity ratings that enable correct selection for any job, regardless of its size or capacity. It is seldom necessary to use more than one Watts relief valve to achieve required discharge capacities. Sizes range from ½" to 1½" inclusive: discharge ratings from 150,000 to 3,000,000 BTU/HR. Learn how this complete line helps you.

AGA listed
A44 SERIES
FOUR MODELS
Home tanks and heaters up to 175,000 BTU/HR. ½" size male inlet

AGA listed
N40 Series
FOUR MODELS
Home and commercial installations up to 500,000 BTU/HR. ¾" size male inlet.

AGA listed
No. 140
For medium institutional, commercial and industrial installations up to 750,000 BTU/HR. 1" size male inlet

AGA listed
No. 240
For medium to large institutional and industrial installations up to 1,125,000 BTU/HR. 1¼" size male inlet



No. 340
For largest hot water storage tanks. Tested capacity 3,000,000 BTU/HR. 1½" size male inlet

Send for . . .
FOLDER No. F-N40

WATTS REGULATOR COMPANY

LAWRENCE, MASSACHUSETTS

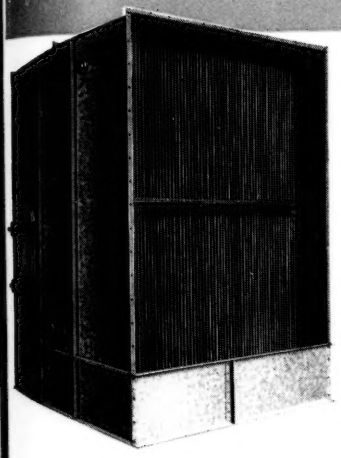
WEIGHTS OF GALVANIZED STEEL DUCTS—1 × 16 TO 15 × 30 IN.

Gage	Weight of Galvanized Steel Duct per Lineal Foot															Gage
16		8.10	8.55	9.00	9.45	9.90	10.35	10.80	11.25	11.70	12.15	12.60	13.05	13.50	14.18	14.63	16
18		6.60	6.97	7.33	7.70	8.07	8.43	8.80	9.17	9.53	9.90	10.27	10.63	11.00	11.55	11.92	18
20		5.10	5.38	5.67	5.95	6.23	6.52	6.80	7.08	7.37	7.65	7.93	8.22	8.50	8.93	9.21	20
22		4.20	4.43	4.66	4.90	5.13	5.37	5.60	5.83	6.06	6.30	6.53	6.76	7.00	7.35	7.59	22
24		3.60	3.80	4.00	4.20	4.40	4.60	4.80	5.00	5.20	5.40	5.60	5.80	6.00	6.30	6.50	24
26		2.70	2.85	3.00	3.15	3.30	3.45	3.60	3.75	3.90	4.05	4.20	4.35	4.50	4.73	4.88	26
Width of Duct, Inches	Square Feet of Duct Surface per Lineal Foot of Duct																Width of Duct, Inches
		2.83	3.00	3.17	3.33	3.50	3.67	3.83	4.00	4.17	4.33	4.50	4.67	4.83	5.00	5.17	
	Height of Duct, Inches																
1		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	1
2	30		16	17	18	19	20	21	22	23	24	25	26	27	28	29	2
3	29	30		16	17	18	19	20	21	22	23	24	25	26	27	28	3
4	28	29	30		16	17	18	19	20	21	22	23	24	25	26	27	4
5	27	28	29	30		16	17	18	19	20	21	22	23	24	25	26	5
6	26	27	28	29	30		16	17	18	19	20	21	22	23	24	25	6
7	25	26	27	28	29	30		16	17	18	19	20	21	22	23	24	7
8	24	25	26	27	28	29	30		16	17	18	19	20	21	22	23	8
9	23	24	25	26	27	28	29	30		16	17	18	19	20	21	22	9
10	22	23	24	25	26	27	28	29	30		16	17	18	19	20	21	10
11	21	22	23	24	25	26	27	28	29	30		16	17	18	19	20	11
12	20	21	22	23	24	25	26	27	28	29	30		16	17	18	19	12
13	19	20	21	22	23	24	25	26	27	28	29	30		16	17	18	13
14	18	19	20	21	22	23	24	25	26	27	28	29	30		16	17	14
15	17	18	19	20	21	22	23	24	25	26	27	28	29	30		16	15
Gage	Square Feet of Duct Surface per Lineal Foot of Duct																Gage
	5.33	5.50	5.67	5.83	6.00	6.17	6.33	6.50	6.67	6.83	7.00	7.17	7.33	7.50			
	Weight of Galvanized Steel Duct per Lineal Foot																
26	5.02	5.18	5.33	5.47	5.63	5.78	5.92	6.08	6.23	6.37	6.53	6.68	6.82	7.05			26
24	6.70	6.90	7.10	7.30	7.50	7.70	7.90	8.10	8.30	8.50	8.70	8.90	9.10	9.40			24
22	7.82	8.05	8.28	8.51	8.75	9.00	9.22	9.45	9.66	9.92	10.15	10.40	10.62	10.97			22
20	9.49	9.78	10.06	10.34	10.63	10.91	11.19	11.48	11.76	12.04	12.33	12.61	12.89	13.32			20
18	12.28	12.65	13.02	13.38	13.75	14.12	14.48	14.85	15.22	15.58	15.95	16.32	16.68	17.23			18
16	15.08	15.53	15.98	16.43	16.88	17.33	17.78	18.23	18.68	19.13	19.58	20.03	20.48	21.15			16

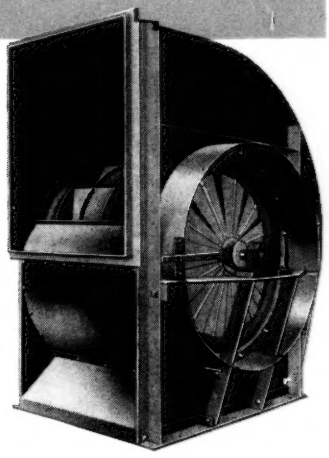
WEIGHTS OF GALVANIZED STEEL DUCTS—1 × 31 TO 15 × 45 IN.

Gage	Weight of Galvanized Steel Duct per Lineal Foot															Gage
16		15.08	15.53	15.98	16.43	16.88	17.33	17.78	18.23	18.68	19.13	19.58	20.03	20.48	21.15	21.60	16
18		12.28	12.65	13.02	13.38	13.75	14.12	14.48	14.85	15.22	15.58	15.95	16.32	16.68	17.23	17.60	18
20		9.49	9.78	10.06	10.34	10.63	10.91	11.19	11.48	11.76	12.04	12.33	12.61	12.89	13.32	13.60	20
22		7.82	8.05	8.29	8.52	8.75	8.99	9.22	9.45	9.67	9.92	10.15	10.40	10.62	10.97	11.20	22
24		6.70	6.90	7.10	7.30	7.50	7.70	7.90	8.10	8.30	8.50	8.70	8.90	9.10	9.40	9.60	24
26		5.02	5.18	5.33	5.47	5.63	5.78	5.92	6.08	6.23	6.37	6.53	6.68	6.82	7.05	7.20	26
Width of Duct, Inches	Square Feet of Duct Surface per Lineal Foot of Duct																Width of Duct, Inches
		5.33	5.50	5.67	5.83	6.00	6.17	6.33	6.50	6.67	6.83	7.00	7.17	7.33	7.50	7.67	
	Height of Duct, Inches																
1		31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	1
2	45		31	32	33	34	35	36	37	38	39	40	41	42	43	44	2
3	44	45		31	32	33	34	35	36	37	38	39	40	41	42	43	3
4	43	44	45		31	32	33	34	35	36	37	38	39	40	41	42	4
5	42	43	44	45		31	32	33	34	35	36	37	38	39	40	41	5
6	41	42	43	44	45		31	32	33	34	35	36	37	38	39	40	6
7	40	41	42	43	44	45		31	32	33	34	35	36	37	38	39	7
8	39	40	41	42	43	44	45		31	32	33	34	35	36	37	38	8
9	38	39	40	41	42	43	44	45		31	32	33	34	35	36	37	9
10	37	38	39	40	41	42	43	44	45		31	32	33	34	35	36	10
11	36	37	38	39	40	41	42	43	44	45		31	32	33	34	35	11
12	35	36	37	38	39	40	41	42	43	44	45		31	32	33	34	12
13	34	35	36	37	38	39	40	41	42	43	44	45		31	32	33	13
14	33	34	35	36	37	38	39	40	41	42	43	44	45		31	32	14
15	32	33	34	35	36	37	38	39	40	41	42	43	44	45		31	15
Gage	Square Feet of Duct Surface per Lineal Foot of Duct																Gage
	7.83	8.00	8.17	8.33	8.50	8.67	8.83	9.00	9.17	9.33	9.50	9.67	9.83	10.00			
	Weight of Galvanized Steel Duct per Lineal Foot																
26	7.35	7.50	7.65	7.80	7.95	8.10	8.25	8.40	8.55	8.70	8.85	9.00	9.15	9.38			26
24	9.80	10.00	10.20	10.40	10.60	10.80	11.00	11.20	11.40	11.60	11.80	12.00	12.20	12.50			24
22	11.43	11.67	11.90	12.13	12.37	12.60	12.84	13.08	13.30	13.53	13.77	14.00	14.23	14.60			22
20	13.88	14.17	14.45	14.73	15.02	15.30	15.58	15.87	16.15	16.43	16.72	17.00	17.28	17.71			20
18	17.97	18.33	18.70	19.07	19.43	19.80	20.17	20.53	20.90	21.27	21.63	22.00	22.37	22.92			18
16	22.05	22.50	22.95	23.40	23.85	24.30	24.75	25.20	25.65	26.10	26.55	27.00	27.45	28.13			16

22
AIR WASHERS



52
FANS



operating 29 years and STILL GOING STRONG

Clarage equipment at the Palmer House

Interesting Facts about this installation as published in Clarage advertising in 1925...

Architects and engineers for the new Palmer House are Holabird & Roche, Chicago. Clarage Equipment purchased by Phillips Getschow Co., Chicago. Clarage Apparatus when completely installed will comprise what is undoubtedly the world's largest ventilating installation. Supply fans deliver 19.35 tons of air per minute, exhaust fans handle 25.7 tons of air per minute, while the washers use 3,700 gallons of water per minute.

"The original Clarage fan equipment is still in operation and of course has been entirely satisfactory."

. . . so reports C. D. Willingham, building superintendent at Chicago's famed Palmer House.

It was in 1925 that the present Palmer House was built — replacing its historically famous predecessor.

The 52 Clarage fans and 22 Clarage air washers installed in this hotel have been **on the job for 29 years.**

In hotels, in industrial plants, in buildings of all types and sizes — users have found and are finding that Clarage is equipment you can RELY on.

Wherever you are, you're close to a thoroughly capable Clarage application engineering office. Call upon this expert assistance . . . or have us send you literature covering the types of Clarage equipment you're interested in.

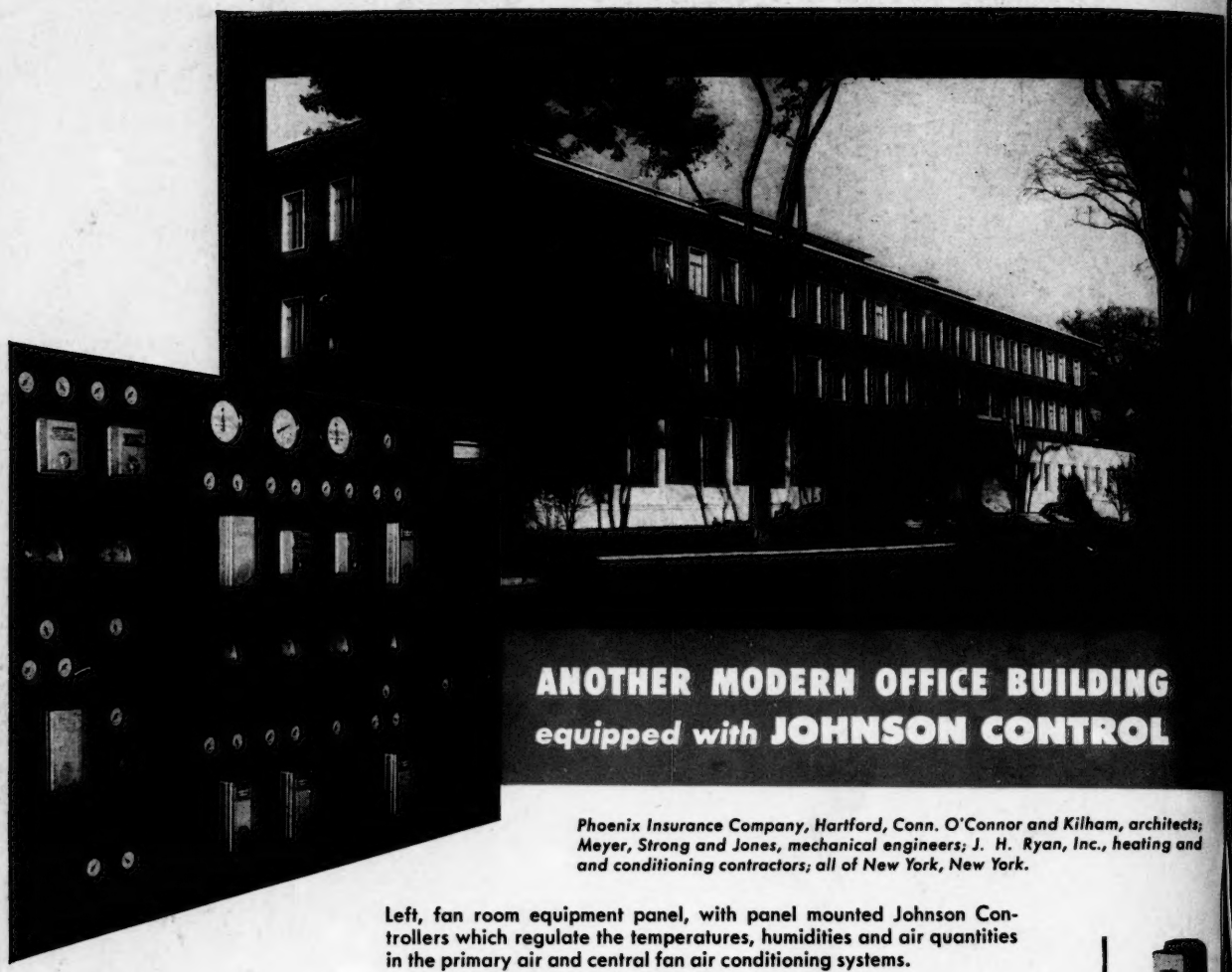
CLARAGE FAN COMPANY, Kalamazoo, Michigan.

You can Rely on...

CLARAGE

Headquarters for Air Handling and Conditioning Equipment

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal



ANOTHER MODERN OFFICE BUILDING *equipped with* JOHNSON CONTROL

Phoenix Insurance Company, Hartford, Conn. O'Connor and Kilham, architects; Meyer, Strong and Jones, mechanical engineers; J. H. Ryan, Inc., heating and and conditioning contractors; all of New York, New York.

Left, fan room equipment panel, with panel mounted Johnson Controllers which regulate the temperatures, humidities and air quantities in the primary air and central fan air conditioning systems.

Among the many notable features of the Phoenix Insurance Company's modern office building in Hartford is a specially designed all-weather comfort control system by Johnson.

Here, 145 Johnson Heating-Cooling Thermostats operate Johnson Valves on the hot and cold water supply to individual room air conditioning units in spaces on the periphery of the building. Johnson *Individual Room* Thermostats operate Johnson Volume Dampers to insure year 'round comfort in the interior zones.

In addition to the *individual room* temperature control, behind the scenes other Johnson apparatus operates Johnson Valves and Dampers to regulate temperatures and humidities of the air supplied by the primary air and central fan air conditioning systems serving the individual room units and the interior zones of the building.

Johnson "Planned-for-the-Purpose" Control Systems are designed specifically for each individual installation. That is why you find Johnson Control not only in outstanding office buildings, such as the Phoenix Insurance Company, but in countless schools, hospitals and every other type of public, commercial and industrial building as well.

Take advantage of the nearly 70 years of experience of the Johnson nationwide organization. It is at your disposal without obligation. JOHNSON SERVICE COMPANY, Milwaukee 2, Wisconsin. Direct Branch Offices in Principal Cities.

T-400 Room Thermostat

T-271 Heating-Cooling Thermostat for Room Air Conditioning Units

D-251 Piston Damper Operator

V-152 Water Valves for Room Air Conditioning Units

JOHNSON *Automatic Temperature and Air Conditioning* **CONTROL**

MANUFACTURING • PLANNING • INSTALLING • SINCE 1885